Vol. 1 — 3

PAVING AND MUNICIPAL ENGINEERING.

A Journal Devoted Specially to Street and Sidewalk Paving, Water Works Construction, Bridge Building, Street Lighting, Sewerage and all Matters Pertaining to Public Improvement in Cities.

ONE DOLLAR A YEAR IN ADVANCE. INDIANAPOLIS, IND., AUGUST, 1890. SINGLE COPIES, TEN CENTS.

J. E. RILEY, PRES., Omaha, Neb. C. W. HUBBARD, SEC., Sioux Falls, S. D. F. W. LITTLE, TREAS., Sioux City, Ia. A. D. TINSLEY, AUD., Sioux Falls, S. D.

THE

SIOUX FALLS GRANITE COMPANY LIMITED.

CAPITAL, $250,000

PAVING BLOCKS

Quarry and Works, Sioux Falls, South Dakota.

C. W. HUBBARD, GENERAL MANAGER.

Sioux Falls Granite

HAS AN ESTABLISHED REPUTATION as a FIRST-CLASS PAVING STONE FOR THE HEAVIEST TRAFFIC. IT HAS BEEN EXTENSIVELY USED in all the LARGER WESTERN CITIES with ENTIRE SATISFACTION. **180,000 Square Yards** *of Sioux Falls Blocks have been laid in Chicago during the last four years for TRACK AND STREET WORK.*

This Company is operating one of the largest and most complete plants in the country, and can fill orders promptly. Present output, 40,000 blocks daily.

General Office, SIOUX FALLS, SOUTH DAKOTA.
Omaha Office, 4 and 5 GRANITE BLOCK.
Chicago Office, 730 OPERA HOUSE BLOCK.

THE INDIANAPOLIS

ALL cities in the United States are invited to send committees or official delegations to Indianapolis to avail themselves of the unequaled advantages afforded by the Exposition for gathering knowledge of paving.

Paving Exposition

EMBRACING

The Largest and Finest Collection of Specimens of Paving

IN THE WORLD,

WILL, on account of its value and beneficial influence in STIMULATING A SPIRIT OF PUBLIC IMPROVEMENT, be continued indefinitely under the management of the Commercial Club of Indianapolis, the organization which originated the idea and made the Exposition a success.

Exhibits of More than Sixty of the Leading American Paving Companies.

New exhibits are being added, and the Exposition will be enlarged and improved in every way possible. Companies not already represented are invited to send exhibits, but no paving material regarded by the committee in charge as being without merit will be admitted to the Exposition. Exhibits must, in all cases, be shipped with freight charges prepaid.

The assurance can be given that more can be learned about paving at this Exposition than by visiting a dozen of the best paved cities in America.

A two-cent stamp should be sent with requests for copies of the REPORT OF THE PAVING EXPOSITION.

For further information, address the Commercial Club, Indianapolis, Indiana.

M. S. HUEY,
GEO. N. CATTERSON,
WILLIAM C. BOBBS,
Paving Exposition Committee.

Paving Granites of the Northwest.

AN ANALYSIS OF SPECIMENS.

By Dr. Cummings Cherry, Chicago, Ill.

I find No. 1, "Green Lake," to be a DIORITE PORPHYRITE, showing it to be HORNBLENDE ANDESITES—containing small particles of quartz, like all other formations of such nature, rather too hard for building. It is extremely hard and brittle. For paving purposes it would necessarily become smooth and slippery. It is flinty, and has the nature of glass. Its origin is considered volcanic. This is the heaviest stone on this market, because it is the most compact.

No. 2.—I find No. 2, "Montello," to be PORPHYRITIC GRANITE, merging into a SYNITE GRANITE. Would be valuable for building purposes, yes, superior, having much cohesion. Well suited for paving purposes, as it contains an equivalent of potash and mica. The weight of this stone is classed next to No. 1.

No. 3.—I find that No. 3, "Fox Island," is a FELDSPATIC GRANITE. It is also a POTASH GRANITE made up of FELDSPAR, HORNBLENDE and MICA. It will not stand FIRE on account of the potash it contains fluxing it when submitted to great heat. It would make good building material, though not very durable, on account of being deficient in SILEX. Would answer well for paving purposes, as it would not slip as would stone much harder. (Digression.)

No. 3 is lighter than the average, contains much more HYDROSCOPIC WATER in its composition and nature.

I find that No. 4, "St. Cloud," is a SYNITE FELDSPATIC GRANITE, made of FELDSPAR, HORNBLENDE and MICA. It would make durable building stone, as the crystalization is fine, and the division of hornblende in its mixture with feldspar and mica, when dressed, would show it to great advantage. This I consider a most valuable specimen for fine buildings and monumental purposes. It contains less HYDROSCOPIC WATER in its composition than No. 3, which it resembles in weight.

I find No. 5, "Thousand Islands," to be another PORPHYRITIC GRANITE. This stone would be easily worked, but not so durable as No. 4. It contains more potash and the HORNBLENDE is not so uniformly distributed. It contains a large per cent. of hydroscopic water, and is therefore liable to disappoint you as a building stone, especially in this, our northern climate.

It would answer very well for paving blocks, as it would not abrade and grind so fine, or be so smooth and glassy as a more compact class of this formation. It is low in SILEX, which factor condition reduces its hardness and consequent durability. It is more porous, hence lacking in compactness and necessarily much lighter in weight.

I find No. 6, "Berlin," to be a QUARTZ TRACHYTE or QUARTZ RHYOLITE or LIPARITE. The FELDSPAR is of this class SANADINE mainly and some PLAGIOCLASE may be present. This rock has a compact or finely glandular substance, which is often porous and rough. It sometimes resembles HORNSTONE or PORCELLANITE, and is found in different colors. It would be hard to work from its compactness and close SILEX texture, would be exceedingly durable, would not disintegrate by exposure to the elements, nor be affected by acids.

This stone would stand much abrasion, and wear well as a paving stone, but would be apt to get glassy and smooth. It contains almost no trace of potash. Its coloring is largely made up of organic matter. It is less in hydroscopic water, hence not affected by the action of the elements. In weight it ranks with No. 1, being very heavy.

I find No. 7, "Sioux Falls," to be a QUARTZITE, and may be termed a LIMONITE QUARTZITE; is a compact, reddish opaque quartz and LYDIAN stone.

It contains little hydroscopic water, is largely composed of SILEX and oxygen, would make excellent paving and building stone. It would stand more abrasion than most of the numbers submitted. Atmospheric oxygen has no influence on it, as it is largely made up of, and contains, INORGANIC OXYGEN. Be it known that INORGANIC OXYGEN is Nature's most powerful adhesive agent, and is always at war with that disintegrating element of Nature known as ORGANIC OXYGEN. This stone has 53⅓ per cent. of the above-mentioned staying element. It is low in hydroscopic water from its fineness and compactness, and being high in specific gravity when compared with the average primitive rock groups.

From its nature, this stone would not become as smooth under the traffic of the streets as some of the other numbers submitted.

TESTIMONIALS.

Sioux Falls Granite Co.: Chicago, Ill., April 5, 1889.

Gentlemen—I have examined the stone furnished by you under the name of Sioux Falls Granite very carefully, and in addition have had it examined in the quarry, in the streets of Omaha, and by chemical tests.

My own observation and the report of Capt. R. W. Hunt satisfy me that it will prove a satisfactory stone for pavement under heavy traffic as well as light. Yours truly,

Wm. R. Northway, City Engineer.

Approved April 5, 1889.

George B. Swift, Commissioner.

Chicago, Ill., March 18, 1889.

W. R. Northway, Esq., City Engineer, Chicago, Ill:

Dear Sir—In accordance with the request of the Sioux Falls Granite Company, I have made an inspection of the streets of Omaha, which are paved with blocks from their quarries, and also visited the latter at East Sioux Falls, Dakota, and would respectfully submit the following report:

The city of Omaha has used five kinds of paving material: Cedar and Cypress Blocks, Barber Asphalt, Colorado Sand Stone, and Sioux Falls Granite, the latter having been placed on the streets sustaining the heaviest traffic. Farnam street is the principal business thoroughfare and presents the Sioux Falls stone under the effect of a 6 per cent. grade, where it has sustained four years of service, and a flat grade where it has been down five years.

Tenth street has been paved with it for six years, and was formerly the heaviest traffic street. St. Mary's avenue has a grade of 7½ per cent., and was laid with Sioux Falls blocks four years ago.

At the intersection of Howard and Jackson with Ninth and Tenth streets the traffic is applied parallel to the laying of the blocks. Most of the heavy hauling from the railroad freight depots passes over these points, and in this manner.

I made a careful study of the various localities, and received most courteous treatment from George W. Tillson, Esq., City Engineer of Omaha, who kindly piloted me to these various points and did all in his power to furnish me with the desired information. I also had an interview with Andrew Rosewater, Esq, Ex-City Engineer of Omaha, who was emphatic in his endorsement of the stone, and said he "had nothing to alter in his official report as City Engineer in 1887." In it he said: "Sioux Falls paving material, doubtless, if all things are considered, ranks at the head of the stone paving material developed in this city."

I also sought interviews with prominent citizens of Omaha, and in every way obtained as much information as seemed possible.

At one point on Farnam street I found the pavement taken up to permit the laying of pipe. This afforded me a most excellent opportunity to judge of how much the stone had abraded. Based on this, and the general appearance of the various streets, I would say that such wear has not yet amounted to enough to be at all appreciable. And the Howard and Jackson streets crossings do not show any rutting; while at other points where the same traffic has been applied in the same way to the Colorado Sand Stone, the rutting is marked. In addition to the general surface of the pavements, the grades of St. Mary's avenue and Farnam street gave me good points to judge of the tendency of the Sioux Falls stone to become glassy. While some smoothness exists, it is in quite a moderate degree, and both Messrs. Tillson and Rosewater told me they had been agreeably disappointed in this respect. I have the former gentleman's assurance that there has not been any breakage or other ill effects from frost, and he has never seen a block broken by the rammer. I could not find any cracks or broken blocks in the pavements. Omaha's climate ranges between great extremes.

To satisfy myself of the uniformity of the stone *in situ*, I visited the quarries at East Sioux Falls, Dak., and made a careful examination. The Granite Company have spent considerable money in developing their property, and have opened three fine quarries. The stone is very regular, and possesses physical characteristics which are remarkable, and which render it very easy to work. While the structure of the stone from the several quarries is practically alike, the colors uniformly vary. For building purposes this is of considerable value, as it permits selection of colors. The stone from the East Sioux Falls quarries appeared to me to be of a higher grade than that found in Sioux Falls. I carefully examined several buildings in which the East Sioux Falls stone had been used, and have also obtained testimony from prominent citizens of Burlington, Iowa, where it has been used in the construction of a large Methodist church. My own observation is in favor of the stone; while one of my correspondents writes: "As to the Sioux Falls granite for building purposes, certainly nothing could be better so far as I am able to judge. It is finer in grain than any other gran-

SIOUX FALLS GRANITE.

ite I have seen, and has a pinkish tint that is attractive. The builders of the church you write about are very proud of it."

I made selections of samples of the stone representing the various colors, and each quarry, the analyses of which are as follows:

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
Silica	96.73	97.14	96.24	97.70	97.60	97.28	98.16	96.00
Iron with a little Alumina	3.27	2.86	3.76	2.30	2.40	2.72	1.84	3.50
	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Three samples tested contain moisture, 00.15.

The absence of mica, together with its density, enables it to withstand the wear of traffic. Its close structure, absence of hydroscopic water, and non-absorption of moisture, render it impervious to the action of frost, and also make it highly resistent to the action of fire.

I made the experiment of heating pieces of the stone to and beyond a bright red, and then quenching some of them in cold water; others I allowed to cool in the air. There was not any tendency to splinter and fly in either case. The treatment altered the structure, but it proved itself to be a good fire stone.

Since my return I have inspected the Sioux Falls stone in the Chicago city railway system, particularly on Archer above Ashland avenue, where it has been laid about three years; also in Van Buren near State street, and in Madison street between Fifth avenue and Market street. At this latter point the stone has been down five years, during the first two of which it was between the rails of the street railway tracks.

At the intersection of Madison street and Fifth avenue there is quite a striking example of the Sioux Falls stone standing up under the same traffic which has heavily worn surrounding blocks of several different varieties of stone.

Of course there is a great difference between the street traffic of Omaha and Chicago, which I have taken into due consideration; but based on all I have seen in the two cities, and have been able to learn from others. I do not hesitate to recommend the Sioux Falls stone as one of the best for paving and building purposes.

I have the honor to remain, yours truly, ROBERT W. HUNT.

KANSAS CITY, MO., June 6, 1888.

E. Riley, Esq., Omaha, Neb.:

DEAR SIR—In reply to your inquiries concerning the use and value of the Sioux Falls stone for street paving, it has been used exclusively here in paving between rail and slot of cable railways, their use extending for the last two years. It is first-class paving material, equaling the best of granite.

Its price in this city being about two-thirds the cost of Missouri granite, causes this department to look upon it with favor.

Yours, JOHN DONNELLY, City Engineer, Kansas City, Mo.

CHICAGO, March 21, 1889.

Hon. Geo. B. Swift, Commissioner of Public Works:

DEAR SIR—In the matter of Sioux Falls stone for paving purposes, I respectfully submit the following report:

I have carefully examined specimens of the stone laid between the car tracks in Madison street and at the intersection of Madison street and Fifth avenue, where the traffic is very heavy, and where the stone is intermixed with both red and gray granites, and can not see that the stone shows any more wear or has any smoother surface than the granites adjoining.

I have the report of Captain Robert W. Hunt, an engineer of first-class reputation, who, at my request, has made a special examination of the stone in the pavements of Omaha and also in the quarries, and he gives it an unqualified approval. He has also furnished me with a chemical analysis of eight samples, giving an average of 92.12 per cent. silica and 2.88 per cent. of iron and alumina, which tends to show that the stone would be very durable. This stone, although not a true granite, is composed almost entirely of the lasting element of granite, viz., quartz.

I do not consider that the fact of its not being granite should bar it from our list, for I believe it to be better in many respects than some of our granites, besides we have already listed three stones at least that are neither granite nor syenite, viz.: the Devil's Lake, the Green Lake and the Berlin.

I would recommend the Sioux Falls stone to be listed as a first-class stone from my own observation and from information received from reliable sources. Very respectfully,

WM. R. NORTHWAY, City Engineer.

Mr. J. E. Riley: ST. JOSEPH, MO., May 9, 1888.

DEAR SIR—In response to your request for my opinion concerning Sioux Falls granite—or quartzite—as a paving material, for heavy traffic I consider it superior to any pavement I have seen.

Yours truly, M. J. MCCABE, City Engineer, St. Joe.

The Sioux Falls Granite Co.: KANSAS CITY, MO., Jan. 24, 1888.

GENTLEMEN—The Grand Avenue Cable Company, of this city, have used a large quantity of your paving blocks during the season of 1887, in the construction of about five miles of double-track cable line. We consider the stone durable and in all respects well adapted to the use we have put it to. Respectfully,

KNIGHT & BONTECON, Engineers.

KNIGHT, Ex-City Engineer.

To Whom it May Concern: OMAHA, NEB., Jan. 23, 1888.

After having used granite paving blocks from the Sioux Falls Granite Company, in the construction of six miles of cable railway tracks in this city, I can cheerfully recommend it as a first class paving material for such purposes. On account of its hardness and solidity it wears well, and from what experience we have here, it seems to stand any changes in temperature.

Very truly, V. SPAUBERG,

Engineer Construction Cable Tramway Co. of Omaha.

Mr. J. E. Riley: OMAHA, NEB., May 17, 1888.

DEAR SIR—In response to your inquiry as to Sioux Falls stone as a paving material, I would say that from my observations of the past six years, I regard the Sioux Falls stone as among the very best of paving stones. It is so compact and non-absorbent that the changes incident to weather, either from moisture or frost, do not affect it; and its resistance to wear and tear from the very heaviest traffic is equal to the best of granites. I was afraid, owing to its quartzite brittle appearance, that it would shatter and become slippy, but within the period of six years' trial in one city, no such developments have taken place. Upon steep slopes I would advise that it be laid in narrow blocks, so as to afford good footing.

Taken all in all I would place Sioux Falls stone at the head of the paving materials for continued heavy traffic roadways.

Very sincerely, ANDREW ROSEWATER,

Ex-City Engineer, Omaha, Neb.

KANSAS CITY, MO., Jan. 25, 1888.

Sioux Falls Granite Co., Sioux Falls, Dak.:

GENTLEMEN—In regard to your letter of inquiry respecting the durability of Sioux Falls granite for cable railway paving, I cheerfully state it is the best material of which we have knowledge for such purposes. Having paved this entire system with the granite received from you, we are thus able to speak from experience.

CLIFT WISE, Chief Engineer,

Kansas City Cable Railway Co.

To Whom it May Concern: OMAHA, NEB., May 18, 1888.

Without any hesitation I commend the Sioux Falls Granite—Jasper—as a first-class stone for paving.

I think its wearing qualities equal to any other in the country. It is uniform in quality, hence the wear is equal.

For streets having a large and heavy traffic, its durability is undoubtedly superior to Medina, Colorado or other sand stone, and, in my opinion, equal to any other granite to be found in America.

I publicly recommend it to our citizens as the cheapest and best material obtainable. Respectfully, ST. A. D. BALCOMBE,

Chairman Board of Public Works, Omaha.

To Whom it May Concern:

Sioux Falls Granite, so-called, has been in use in this city for a number of years—on Tenth street—which sustains the heaviest traffic of any street in the city, it has been laid five years, and it shows no abrasion whatever. I believe there is almost no limit to its durability under ordinary traffic.

Some fears that were entertained at one time, that the blocks might wear smooth and make them slippery, none have ever been realized. With blocks that are not too large, I believe it will make a stone pavement that it will be hard to improve upon.

GEORGE W. TILLSON, City Engineer, Omaha.

Warren-Scharf Asphalt

Paving Company,

CONTRACTORS FOR

PAVEMENTS

Of Genuine Trinidad Asphalt,

The Ideal Pavement of Modern Times.
No Longer an Experiment.
Experience has Established its Superiority.

Over five millions square yards, equal to about 285 miles of street thirty feet wide, in successful use in over forty cities of the United States and Canada.
For full information and estimates apply to

WARREN-SCHARF ASPHALT PAVING CO.,

81 Fulton Street, New York,

or 23 BLYMYER BUILDING, CINCINNATI, OHIO.

GEO. MOERLEIN, Pres. JNO. GOETZ, JR., V. P. J. A. EBERHARDT, Sec. Treas. & G'l M'r

THE Southern Granite Company

Estimates for Architectural, Monumental and Street Paving Work will be promptly furnished.

OFFICES:

19 and 20 Wiggins Block, CINCINNATI, OHIO.
20 Kimball House, ATLANTA, GA.

GREENCASTLE Brick, Stone and Lime COMPANY.

Building, Bridge, Flagging, Curbing, Stepping and Crushed Stone.

FINE PRESSED BRICK.

LIME IN CAR LOAD LOTS. Coloring Sand, Etc. Correspondence Solicited.

GREENCASTLE, IND. Works at Oakalla.

A. H. PERKINS, President. W. D. HITCHCOCK, Vice-President. V. W. FOSTER, Sec'y & Treas.

THE WESTERN PAVING and SUPPLY COMPANY.

CONTRACTORS FOR

Genuine Trinidad Asphalt Pavements,

AND DEALERS IN

PAVING MATERIALS,

Room 7 Ingalls Block, INDIANAPOLIS.

OFFICE TELEPHONE 737. Yard & Works: Cor. Michigan & Indiana Ave. TELEPHONE 380.

S. H. SHEARER, Manager.

PRINCIPAL OFFICE, CHICAGO, No. 8 The Rookery. DETROIT OFFICE, Cor. Jefferson Ave. and Griswold St.

THOS. H. SPANN, President. JNO. G. PENDERGAST, Vice-President.

THE INDIANAPOLIS Paving Company

BRICK PAVING.

We handle the CELEBRATED HALLWOOD BLOCK.

W. A. RHODES, Secretary and Treasurer, 72 East Market St., Indianapolis, Ind.

ASPHALT. ASPHALT.

THE BARBER Asphalt Paving Co.

The Oldest and Largest

Asphalt Paving Company in the United States; has laid Asphalt pavements in twenty-seven cities of the Union, on 607 streets of a length of 255 miles, or an area of 2,916,574 square yards. It has laid more pavement in twelve years than all other Asphalt Paving Co's in Europe and America Combined have laid in thirty years.

General Offices, No. 1 Broadway, New York.

LE DROIT BUILDING, WASHINGTON, D. C.

DO YOU MAKE PAVING BRICK?

The signs of the times point to a greatly increased demand for this class of ware
And a wise man is he who arranges to meet this demand and to

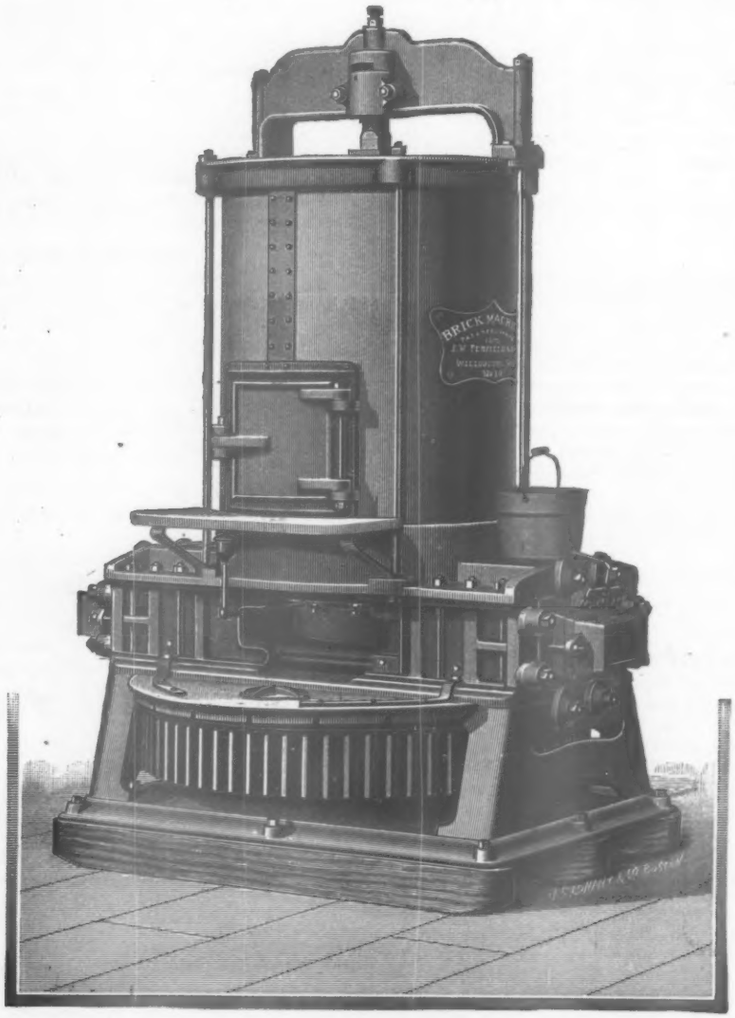
USE

The PENFIELD

Stiff Clay

Machinery
For Paving
And Building Brick

Complete Outfits
A Specialty.
Pug Mills,
Granulators,
Elevators,
Hoisting Drums, Etc



No. 15 "D" Brick Machine.

Upright

Stock Brick
Machinery, for
Sand Mold Brick.

Satisfaction
Guaranteed.
Clay Crushers and
Stone Separators,
Iron Dry Cars,
Turn Tables, Etc.

BRICK MACHINERY

WE MANUFACTURE CLAY WORKING MACHINERY OF ALL KINDS.

FOR CATALOGUES AND FULL PARTICULARS, ADDRESS

J. W. Penfield & Son, Willoughby, Ohio. U. S. A.

PAVING AND MUNICIPAL ENGINEERING

VOL. 1. INDIANAPOLIS, IND., AUGUST, 1890. No. 3.

CONTENTS.

	PAGE.
Real Asphaltum—How to Tell It ..... *J. W. Howard, BL., C. E.*	39
Portland Cement—What Is It? ..... *W. L. S. Bailey, C. E.*	40
Grades and Paving Material	40
Paving Experience in Columbus, O.	41
Asphalt Discovered in Colorado	42
Street Lighting in Twenty Cities	42
Purification of Sewage	43
Kentucky's Bituminous Sand-rock Deposits	43
A New System of Stone Paving	51
Rubble and Sand Foundations	51
Improvement Expenditures in Duluth	51
Patch Nothing ..... *F. E. Lockling, C. E.*	45
Asphalt Mines ..... *Chas. W. Saacke*	51
EDITORIAL—	
Words of Encouragement	44
Paving in Philadelphia	44
Supervision of Public Improvements	45
Notes	45
MUNICIPAL ENGINEERING NEWS—	
Paving and Grading	46
Water-works	47
Sewers	48
Bridges	49
Street Lighting	50
Street Railways	50
Public Parks	50

REAL ASPHALTUM—HOW TO TELL IT.

By J. W. Howard, BL., C. E.

THE arts and manufactures consume, each year, several million dollars worth of real asphaltum and its compounds. The questions are often heard: What is genuine asphaltum? How can it be known and distinguished from coal-tar and other imitations?

A full answer to these questions would involve some geology, much mineralogy and a great deal of chemistry. Nevertheless fair answers, in popular language, can be given, which will help distinguish the real from the false material.

WHAT IS ASPHALTUM?

We find the principal *bituminous substances* in nature to be: 1. *Natural naphtha.* 2. *Petroleum.* 3. *Maltha* or soft mineral bitumen. 4. *Asphaltum* or hard mineral bitumen.

These are all composed principally of more or less hydrogen, carbon and oxygen.

Because of a confusion which has arisen from the fact that spurious and "artificial" asphalts are made from coal-tar and its products, it is well to give the names of the leading mineralogists and geologists, whose books can be consulted in either English, French or German, as the case may demand. Using as authority the works of Dana, Le Conte, Bischof, Meyne, Credner, Dietrich, we can establish the following:

MODEL DEFINITION OF ASPHALTUM.

Asphaltum is the Latinized Greek word ἄσφαλτος (asphaltos). When pure, or nearly pure, it is dark brown to black, brittle at ordinary temperatures, smooth, pitch like and shell like fracture, sectile; when rubbed it emits a bituminous odor, peculiar to itself (no resemblance to the sharp, pungent odor of coal-car). The specific gravity of asphaltum is from .98 to 1.68. It is insoluble in water. It begins to melt at about 212° Fahrenheit, and when ignited it burns with a bright smoke-tipped flame.

Some of the names given to asphaltum are, asphalt, bitumen mineral-pitch, Jew's-pitch, Trinidad-asphalt, Mexican asphalt or chapopote, etc.

Certain European asphalt paving companies have attempted to call a limestone, saturated with asphalt, by the single name "asphalte." Limestone, sand, earth, etc., can be saturated with asphalt but these compounds are not pure asphalts.

In America the popular error is in another direction. The products of coal distillation, or the gas-tars or coal-tars have, again and again, been sold by the name of "asphalt" either in deception or in ignorance. The real names of these coal-tar products, as now named at the places of manufacture, are "*Distillates*," and they are numbered No. 1, 2, etc., according to their comparative density, etc. Another name given them, probably to hide their origin, is "bituminous cement." These artificial coal coal-tar products have legitimate and useful uses; but they can not take the place of genuine natural mineral asphaltum, neither in street paving surfaces nor in varnishes nor japans. Nor should coal-tar be used as an adulteration of asphalt.

Asphalt and coal-tar differ in origin, composition and odor. A general similarity, in color and appearance, easily deceives a few, especially when some asphalt has been mixed with the coal-tar. When asphaltum is used for street paving it is combined with sand, limestone, etc. Great care is needed that the city officials and the tax-payers quickly detect any attempt to adulterate with any product of coal-tar. Gas-tar and coal-tar are practically identical. "Paving-pitch" is a name given to a prepared coal-tar. Coal-tar is a product of distillation and a by-product of the gas works, and it soon loses by natural evaporation its volatile oils and becomes a dry powder. Genuine natural asphaltum retains its fixed oils; hence its lasting qualities in pavements and varnishes.

HOW TO TELL ASPHALT FROM COAL-TAR.

Apply to any gas-works or to a coal-tar roofer and get a piece of brittle coal-tar or even a soft variety. Then apply, by letter or in person, to some reliable dealer in natural asphalt. Get a piece of real asphalt. (Refined asphalt is the best.) The kind easiest obtained is refined Trinidad asphalt. Any business directory will give the names of such dealers. Their names also appear in PAVING AND MUNICIPAL ENGINEERING and some other engineering papers. Having obtained the two samples, one of coal-tar, the other of asphalt, place them side by side. The coal-tar emits a sharp, acrid odor, easily perceived. The asphalt must be rubbed hard to emit a strong odor. The asphalt odor will be quickly learned. It is entirely different from the coal-tar odor. The asphalt odor is known as the "bituminous odor." It is rather agreeable, perhaps a little sour smelling. Crude and refined asphalt, when quite cold, emits a weak, clay-like odor. Next taste one sample, then the other. Then attempt to chew a little of the refined asphalt. It will crumble. If it be an "asphalt paving cement," made from genuine asphalt and residuum oil of petroleum, a fairly

agreeable chewing gum is the result. Any attempt to chew coal-tar will result in disaster to the teeth, for it is very sticky and hard to remove from the teeth.

Now turn to the definition of asphaltum, already given, and apply any test which it suggests. The differences will soon be learned. Retain the pieces of coal-tar and asphalt for comparison with any material proposed for use as an asphalt.

Adulterations of asphalt with coal-tar need careful chemical analysis to detect the cheat and to establish the per cent. present. However, if much coal-tar has been added, as in a "vulcanite," which often is a mixture of 25 per cent. asphalt and 75 per cent. of coal-tar, then the odor immediately betrays the tar.

The asphalt industry has become of great importance in Europe and America. Besides entering into hundreds of miles of excellent pavement, it is used in the production of vast quantities of glazed or patent leather, also for certain cements, paints, varnishes, etc.

Asphalt has long since become a valuable, standard material of civil, mechanical, military and naval engineering as well as in architecture.

PORTLAND CEMENT—WHAT IS IT?

By W. L. S. Bailey, Stone and Cement Expert.

The Name—Comes from its resemblance — and that only—to the famous building stone of "Portland Bill," in the south of England.

Its Age—Is sixty years, being first made in "1830."

Its Chemistry (one of many samples)—Calcium, 62 per cent.; silica, 23 per cent.; alumina, 8 per cent.; ox. of iron, 4 per cent.; miss., 3 per cent.

Principal Elements—Chalk and Clay.

Chemical Division of Elements—

CHALK—Lime, 56.50 per cent.; carbonic acid, 43 per cent.; water, 0.50 per cent. Total, 100 per cent.

CLAY—Silica, 68.45 per cent.; alumina, 11.04 per cent.; lime, 0.75 per cent.; ox. of iron, 14.80 per cent.; soda and k., 4.36 per cent.

Its Color—A light water green grey. Probably from alumina.

Note—Any off color, yellow, red or brown, is in proportion to the amount, an unfavorable condition or element, because it shows that the decarbonization was not perfect, owing to a lack of the intense heat so essential, or a lack of time.

Requirements—Elements must be clean and pure. Best mechanically prepared appliances. Great care. Pure water. Intense heat—three months' time nearly.

Method of Manufacture—The chalk and clay are immersed in water till dissolved; the water is tipped off, the compound is dried, then broken up, decarbonized in the kilns by great heat. It is then called "clinker." The clinker is then ground and pulverised to a 2,800 or 3,000 "mesh," and is ready for use.

Favorable results always follow the above process if the elements are chemically true and pure.

The English or "wet" system is the only one now used.

TESTS—*1st, the Weight*—A barrel of Portland must weigh more than 400 pounds, according to the size of the package. *The Fineness*—From 2,500 to 3,000 mesh. *Strain*—Four hundred and fifty pounds after "seven days," or better.

Its Life—Like pure dry paints, or like flour—when good—in the hands of the housewife, true cement will "bank or stand up" when the supporting fingers are removed. Again, spat in your hand in which you have placed a small quantity of true cement, and you will find a capillary effect not noticeable in the inferior grades.

Adulterations—Can not be successfully made when the color is there; when the weight is great; when it is "as fine as velvet;" when great strength is developed, and the "life test" is favorable.

Safe and Economical Comparisons—

PORTLAND CEMENT	*versus*	"NATIVE CEMENTS."
Best when very heavy.		Best when light.
Grows stronger with age.		Weakens with age.
Is slow to set.		Is quick to set.
Has all the "staying" elements.		Has few or none.
Stands great strains.		Used for light work.
Can be mixed "one in ten."		Mixed one in three.

Showing that for all uses, except under water, where quick setting is needed, Portland costs less than Native.

Good Mixtures—For Mortar: One to three for the best, and one in eight in safe places.

For Concrete: One cement, four crushed stone, medium and larger; two and a half screened screenings; two coarse, clean, sharp sand.

Stone Material: Crushed silicate limestone is the best common material; crushed western granite, all sizes, comes next; but crushed "quartzite," all sizes except dust, without sand, makes the strongest concrete known.

The above having been my experience, you will not think strange that I take exceptions to the use of the word "concrete" in place of "beton." The best engineers make a sharp distinction in favor of the exclusive use of the word "concrete" when Portland cement is used as a bond, and "beton" when Natural cement is so used. Of course I do not know that in all cases correspondents of PAVING AND MUNICIPAL ENGINEERING use natural cements for their road foundations, but by the costs given, I am quite confident that they do thus use it.

Natural cements manufactured with the same care as is Portland, could be made to grade quite high for safe places—but, I submit that the foundations of street paving, subject as it is to the *stocks* of traffic, is not and can not be considered a safe place in the correct meaning of the phrase.

GRADES AND PAVING MATERIAL.

MESSRS. Rudolph Hering and Andrew Rosewater, employed as consulting engineers to consider the engineering needs of Duluth, Minn., were asked, among twelve other questions, "What is the best material with which to surface streets having a grade exceeding ten per cent., and to what grade is it practicable to lay cedar or pine block paving?" Their answer is given below:

"In the selection of suitable paving material for streets, two factors present themselves for consideration, namely, the surface or wearing material and its foundation. The life of pavements and their satisfactory maintenance depends as largely upon a durable and unyielding base as the walls of a building depends upon the solidity of its foundation, to preserve it from cracks and uneven settlement. The selection of economical paving material should be based upon a due consideration of the bed and gradients of the streets or avenues to be paved, and of the available facilities for efficient drainage. With clay or rock beds and light gradients, either sand, gravel, broken stone or concrete, can be used with reasonable assurance of good results. With steep gradients or wet, marshy soil, the stability of the foundation enters largely into the question. Experience demonstrates that under all the varied conditions, a foundation of concrete, composed of broken stones or gravel, and cement mortar in suitable proportions, is the best; a bed of compact layers of broken stone (macadam) is the second best; gravel comes next, and sand last, of the four materials mentioned.

"In view of the importance of preserving the foundation in proper form, and to counteract the tendency to washout or settle unevenly, on the steep grades of the Duluth avenues and streets we

suggest the use of either concrete or broken stone in layers thoroughly compacted. On streets built upon low or filled in ground, broken stone or gravel will do well. Sand should only be used as a foundation upon the more level roads having a compact natural bed. Where there is danger of moisture penetrating the road bed, a line of blind drains should be laid below the curbs discharging into the corner inlets.

"To prevent the foundations from sliding on steep gradients they should be anchored at suitable intervals by concrete ribs or bars, of from six to twelve inches in depth below the concrete base, placed across the avenues.

"The character of the wearing surface or paving material to be selected and the method of its preparation depends largely upon the price of the material available for such purposes, its adaptability to the gradient of the surface to be paved, its relative durability, its liability to derangement after being laid, the cost of maintenance, and upon the liability to interfere with the drainage.

"To meet the requirements of travel, a paved surface must be favorable to the easy movement of horses and vehicles. It must be able to resist the disintegrating action of the elements for a reasonable number of years; for sanitary reasons it must be capable of ready cleansing, and lastly, easily repaired at reasonable cost. To be favorable to the easy movement of horses and vehicles, the pavement must afford a secure foothold to the horse, must admit of such rapid transit as the gradients of the roadway will allow, with the minimum jarring of the wheels, and in connection with the most effective foothold, must develop the least resistance to traction. In other words, for light vehicle traffic, a pavement must admit of the best attainable speed; it must be as noiseless as possible and produce the minimum amount of jarring to the vehicle. The extremes of the gradients of the roadways, which prevail in the city of Duluth, reaching as they do to thirty-two per cent., calls for a diversion from the usual form and manner of application. Of the pavements which we deem suitable to the conditions presented in Duluth, we suggest the following within the specific limits named:

STONE.

On grades of ten per cent. or less, rectangular stone blocks of the usual size and pattern, with sand joints, to be laid on a foundation of concrete or broken stone.
Probable cost per square yard ..... $2.75 to $3.25

On grades exceeding ten per cent.—
(1) Rectangular stone blocks, ranging from three and one-half to four inches in width, and chamfered on the upper edges. The chamfering is needed to afford a safe foothold essential for horses to overcome very steep grades.
Probable cost per yard, if laid on a broken stone foundation..... 2.75 to 3.25
And when laid on concrete.. ..... 3.00 to 3.50
(2) Kidney or cobble-stone, selected of nearly equal sizes, not exceeding three inches in thickness, laid on a concrete foundation and set in cement mortar.
Probable cost per yard..... 2.00 to 2.50

BRICK.

On grades up to six per cent.—
Best paving brick laid on concrete.
Probable cost per yard..... 2.25 to 2.75

On grades exceeding six per cent.—
Best paving brick laid on a concrete foundation.
Probable cost per yard..... 2.50 to 3.00

SHEET ASPHALTUM.

On grades less than four per cent.—
Laid on concrete.
Probable cost per yard, maintained for 5 years..... 2.25 to 3.00
Probable cost per yard, maintained for 10 years... 3.00 to 3.50

WOOD.

On grades less than six per cent.—
Ordinary round cedar blocks laid on concrete.
Probable cost per yard..... 1.80 to 2.00
Ordinary round cedar blocks laid on broken stone and boards.
Probable cost per yard.... ..... 1.50 to 1.60
Rectangular pine blocks of usual form and size, laid on concrete foundation.
Probable cost per yard..... 2.25 to 2.40

On grades above six per cent.—
Round cedar blocks, from four to five inches in diameter, and chamfered to a diameter of three inches at the top, laid on concrete.
Probable cost per yard..... 2.00 to 2.25
Rectangular pine blocks, with chamfered edges, or plain with a width of three or three and one-half inches and set with inch or inch and a quarter joints, both laid on concrete.
Probable cost per yard..... 2.40 to 2.60

"In order to realize the advantages of the chamfered blocks and wide joints, for the purpose of affording a foothold on steep grades, it is important that the pavements be frequently swept and the grooves between the blocks be kept open.

"While macadam and Telford pavements possess unexcelled merit as roadways, the expense of maintenance places them, together with gravel-surfaced roads, in the list of temporary pavements. In view of the constant tendency of their component parts to wash into the gutters and inlets, their use is not advisable for steep grades. However, if the upper layer of either of these pavements is treated with coal-tar, binding the parts together, it is possible they will satisfactorily meet all the demands of a temporary pavement for gradients up to sixteen per cent.

"For grades exceeding ten per cent., we suggest the following pavements:

(A) Rectangular stone blocks with chamfered edges.
(B) Kidney, or cobble-stones.
(C) Best hard and tough paving brick, of special form.
(D) Cedar blocks with chamfered edges.
(E) Pine blocks with chamfered edges or wide joints.

"Of the above pavements we regard the chamfered stone blocks the best, but most expensive, and the pine blocks least desirable because the least durable.

"In view of the unusual conditions in Duluth, we advise that the pavements B, C and D, of the above list, be tested upon some of the steeper avenues to the extent of a block each. We consider that only an actual trial will solve the problem of the most desirable pavement for the avenues of Duluth."

PAVING EXPERIENCE IN COLUMBUS, O.

THE city engineer of Columbus, O., has prepared a general reply to the inquiries that he continually receives regarding the experience in that city in street paving. It covers the subject comprehensively. The main part, of general interest, is as follows:

"We have all kinds of pavements, good, bad and indifferent. If the citizens of Columbus could have had the benefit of demonstrative information, such as our city now affords to others, they would have considered themselves more than favored. By inspection of our beautifully paved city, there is no reason why mistakes in the selection of good paving material should occur in other places. We have *all* kinds, brought about to a large extent by means of lack of or mis-information, this being particularly true as regards brick streets. The laying of red and fire brick for this purpose has almost uniformly resulted in furnishing a costly experiment, in this city at least. The undersigned has heretofore notified the Committee on Streets and Alleys of the danger in selecting so-called paving material of this nature. The experiments have been made and the results are self evident. This kind of pavement is thus referred to not for the purpose of producing opinion against it, but on the contrary, the undersigned holds in high regard this material where the proper quality is used. The tendency to construe bricks as fit for paving, simply because they seem to be hard, is erroneous, and the difficulty in selecting the good from the inferior can not be over-estimated. This last difficulty is true to a great extent as to the use of all kinds of paving material, but especially so as regards brick, owing to the general tendency of the public towards low prices rather than quality.

"Our work is let by the square yard complete, including excavation, foundation and coal-tar cement filling.

"The following is an estimate of the cost of laying the various kinds of pavement as set forth:

Georgia granite block	$4 23	to	$3 75
Alderson Virginia block	4 00	to	3 75
First class Medina block	3 94	to	3 70
Second class Medina block	3 19	to	2 98
Greenfield block	3 25	to	3 00
Hayden block	2 35	to	2 25
Hallwood block	2 35	to	2 20
Asphalt, 4 inch. concrete foundation	2 40	to	2 00
Asphalt, 6 inch. concrete foundation	3 00	to	2 75
Wassall fire clay brick	2 00	to	1 95
West Virginia fire clay brick	1 90	to	1 85
Terra cotta fire clay brick	2 25	to	2 22
Zanesville red brick	1 85	to	1 75
Cleveland red brick	2 00	to	1 90
Middleport red brick	2 00	to	1 80
Red brick on board foundation	2 00	to	1 75

"All of these pavements are laid under a very thorough specification. All except asphalt have a foundation of broken stone eight inches thick, rolled with a ten-ton roller, and the joints of the blocks or brick, after being laid, are filled with coal-tar pitch. The price includes grading and foundation—everything except curb, which costs about 45 cents per foot. Asphalt has a cement concrete foundation six inches thick with a surface of asphalt two and one-half inches thick. From my experience and observation I would place the comparative probable wear of these pavements, assuming that each is laid in the best manner and of as good material as can be obtained, and assuming that the wear and tear would be the same as on Columbus streets, such as these different pavements have been laid on, as per following table:

Granite or Medina stone block	40 years.
Hayden or Hallwood block	20 "
Asphalt	15 "
Fire brick	10 "
Red brick (ordinary)	5 "
Red brick (best quality)	10 "

"I mean, in the above, that they will, in my opinion, if well laid, last the time named, without extensive repairs. You can easily judge from this that though the first four named cost the most, they are the cheapest in the end. I will explain that the reason why red brick are placed so low on the list is that no manufacturer has yet produced a red brick of reliable uniform wearing quality in any quantity large enough to be of much account in street paving. The fire brick people have done better, but are far from perfect as yet."

ASPHALT DISCOVERED IN COLORADO.

W. R. THOMPSON, of Meeker, Colorado, reports that, with several other persons, he, a short time ago, discovered a deposit of asphalt in Colorado. In an interview published in the Denver *Republican* he said:

"Several other gentlemen from Meeker, among whom were Peter and Simpson Harp, Charles Attix, postmaster; John Gould, several others whom I can't name and myself discovered a deposit of asphalt about ten or fifteen miles from the Indian reservation, and at once staked off claims. All were taken out under placer claims of twenty acres each. At first the vein was only about two feet wide, but in following it up we came to a pocket resembling a small lake in the mountains, which was about forty feet across. The material in its crude state resembles taffy, and is as flexible. Our claim is about forty-five miles from Meeker in a southwesterly direction, and about thirty-five miles from the nearest railway station. We can not afford to freight the asphalt at present, and will hold the claims until we have a good market for it."

"Do you know anything about the asphalt beds on the Indian reservation?"

"There have been enough beds of asphalt discovered in the reservation now occupied by the White River Utes to pave Denver and another city fully ten times as large; in fact, I think it is the largest supply of asphalt to be found in the world, and it is also the finest. I would like to see the streets of Denver paved with asphalt, for I think it will be a great advantage to the state of Colorado and open up these beds, which I believe are the finest and largest in the world."

STREET LIGHTING IN TWENTY CITIES.

IN beginning an investigation of the cost of street lighting a committee representing the Kansas City councils sometime ago sent to the different cities of the country a series of questions, the answers to which gave much important and valuable information which is embodied in a report recently issued. The following shows the cost in fifteen cities of gas lighting:

Name of City.	Schedule.	No. of lamps.	Cost of each per year.
Kansas City	Moonlight	1,482	$20.00
Baltimore, Md	All night.	6,436	22.50
Binghamton, N. Y	All night.	60	23.75
Birmingham, Ala	Moon.	50	15.00
Buffalo	All night.	4,194	21.79
Chicago, Ill	All night.	24,447	20.00
Cincinnati, O	All night.	8,288	1.01 per M. ft.
Cleveland, O	All night.	4,650	18.54
Milwaukee	All night.	2,200	24.17
Montreal	All night.	700	17.00
Philadelphia, Pa	All night.	18,074	21.90
Richmond, Va	All night.	1,275	Own their works.
St. Louis	All night.	691	30 00
Springfield, Ill	All night.	815	20.00

Gasoline lighting, which is necessarily used in districts where other light can not be obtained, varies in cost from 90 cents to $2.25 a month, as follows:

Name of City.	Schedule.	Number of Lamps.	Cost per month.
Kansas City	Moon	1,400	$2 25
Akron, O	Moon	450	1.34
Baltimore, Md	All night	859	.90
Chicago, Ill	Both	8,608	1.08
Cincinnati, O	All night	1,708	1.03
Cleveland, O	All night	6,028	1.24
Columbus, O	Moon	600	1.31¼
Lancaster, Pa	All night	162	1.87
Lincoln, Neb	Moon	230	1.16⅔
Lowell, Mass	7 h. per night	416	1.60
Omaha, Neb	All night	900	1.41
Philadelphia, Pa	All night	6,476	1.75
Pittsburgh, Pa	All night	3,100	1.00
Providence, R. I	All night	600	1.68
Sioux City, Ia	Moon	300	1.40
Wichita, Kan	Moon	480	1.70

The cost and candle power of electric light in twenty cities supplied by private corporations as well as the number of lights used are as follows:

Name of City.	Schedule.	Number of lights	Cost per night, cents	Candle power
Kansas City	All night.	114	55	2,000
Atlanta, Ga	All night.	596	53½	2,000
Baltimore, Md	All night.	607	40	2,000
Binghamton, N. Y	All night.	123	36	2,000
Birmingham, Ala	All night.	100	33	2,000
Buffalo, N. Y	All night.	1,296	40	2,000
Cleveland, O	All night.	100	38	2,000
Denver, Col	All night.	216	53	2,000
Duluth, Minn	All night	186	35	2,000
Jackson, Mich	All night.	210	24	2,000
Lowell, Mass	All night.	180	50	2,000
Memphis, Tenn	All night.	100	50	2,000
New Bedford, Mass	All night.	90	40	2,000
New Haven, Conn	All night.		48	2,000
Richmond, Va	All night	134	40	1,200
St. Louis, Mo	All night.	1,587	20½	2,000
Sedalia, Mo	Moonlig't	91	24¼	2,000
Springfield, Ill	Moonlig't	110	38¾	2,000
Troy, N. Y	All night.	279	39½	2,000
Wichita, Kan	All night.	90	30	2,000

The committee finds that the smaller cities and towns are furnished light at lower rates than the larger cities, which is regarded as unaccountable. There is a saving in cities operating their own electric plants, as the following indicates:

Name of City.	Number of lamps.	Candle power.	Cost of each light per night.
Bay City, Mich	134	2,000	.16⅔
Bloomington, Ill	220	2,000	.20
Chicago, Ill	520	2,000	.19
Hannibal, Mo	96	2,000	.14½
Lewiston, Me	96	2,000	.11½
Little Rock, Ark	110	2,000	.13½
Madison, Ind	85	2,000	.13½
St. Joseph, Mo	208	2,000	.14½
Topeka, Kan	184	2,000	.18

There is also an advantage in cities owning their own gasworks, according to the experience of Richmond, Va., set forth in

the last annual report of the superintendent of the gas-works, as follows:

Received for gas		$185,451 31
Received for coke		21,501 50
Total		$206,952 81
Disbursed for pay-roll	$78,795 74	
Disbursed for coal	60,420 04	
Expenses	9,346 42	
		148,562 20
Net receipts over expenditures		$58,390 61
To which must be added 43,135,687 cubic feet of gas, consumed by street lamps and public buildings, at $1.50 per 1,000 feet		64,703 53
Showing a total in favor of works of		$123,094 14

The committee finds that Kansas City is paying too much for light, and recommends the purchase of an electric plant for the lighting of the city's public building, and in some of the central business streets. The three systems of lighting are to be continued, however, under new contracts.

PURIFICATION OF SEWAGE.

THE Worcester *Spy* describes the first trial of the new sewage purification works in that city recently as follows:

"The plant consists mainly of a series of large open tanks or basins, solidly constructed of brick, and having a combined surface area of about an acre, and a building in which are a mill for grinding the chemicals and vats in which these chemicals after being ground are mixed with a small quantity of crude sewage. This mixture is thence discharged into the stream which flows from the sewers into the brick basins, where the chemicals, chiefly lime, combine with some of the impurities, forming a coagulum, which, as it settles, carries with it to the bottom of the basins the other impurities, leaving the clarified sewage almost as clear and limpid as pure spring water. This clarified sewage is then allowed to flow off into the river, where our friends in the valley below are expected to find it wholly unobjectionable, and the sludge is drawn off from below and deposited on land adjacent to the works, where it will be plowed under, and is expected to cause no detriment to the health or comfort of the neighborhood. The basins are so constructed that all may be used simultaneously, or the flow of sewage may be cut off from any one or more of them for removing the sludge, for cleansing or repairs. When the system is in practical operation one of the basins will probably be empty or in the process of emptying, while the others are in use.

"On Wednesday, for the first time, the sewage was turned into the new works, and the first trial was made in America on a large scale for the process of chemical precipitation for purifying sewage. The discharge from the sewer flowed into the basin, a dark, foul, noisome flood. One tank was filled, the stream was shut off, and in half an hour water dipped from the basin was clear, without odor, and with only the slightest possible trace of discoloration. This very gratifying result, after the sewage had settled for half an hour only, justifies the confident belief that after passing in succession through several tanks, with opportunity for further settlement in each, the effluent will be as free from all objectionable matter as could be desired. This, however, is only the first trial of the new process.

"Further experiments will be necessary to determine the best combination of chemicals, and the proper quantity to make the process most efficient with the least expense, and other conditions which will best secure the efficient and economical operation of the works. These experiments will be made carefully and their results used to bring the new system into uniform operation.

"The cost has been less than it was at first feared that it would be. The total appropriation was about $135,000, of which not all has yet been expended. More than half of this sum was for the cost of the outfall sewer from the main sewer to the purification works. The capacity of the works is ample for the purification of 9,000,000 gallons of sewage daily, which is more than the present volume of city sewage. The annual cost of the process is expected to be somewhat more than $20,000, depending in some measure upon the quantity of chemicals which may be found necessary."

KENTUCKY'S BITUMINOUS SAND-ROCK DEPOSITS.

A DISCOVERY has just been made across the border in Kentucky about sixty miles from Nashville that is likely to prove a factor in the development of a large and important industry in this country. A few months ago it was found that a certain district in the northwestern portion of Logan county, Kentucky, heretofore classed as the poorest and most worthless in the State, contained asphaltum in practically inexhaustible quantities. *The American* published the particulars of the discovery at the time, and also stated that a wealthy Boston syndicate was buying up the land in that vicinity at prices that a few weeks ago would have been considered fabulous. A mountain of the coveted mineral was on an old farm of three hundred acres, the property of Mr. John I. Ferguson, of Ferguson Station, Kentucky, and this piece of property, which was bought by Mr. Ferguson a few years ago at $600 to save a debt, was sold for $10,000.

Mr. Ferguson, who is a wealthy tobacco dealer, farmer and merchant in South Logan, was in the city yesterday, and was asked concerning the new discovery. He said he did not know exactly what was going to be done, but that the mineral was there in immense quantities. He said it was the more valuable because it is only found in paying quantities in two or three localities in the United States.

His attention was first called to it on account of the recent oil excitement throughout the country. It appeared to him to be an immense stratum of sand-rock running through a large hill. This rock had a black surface, and in hot weather a black substance resembling coal tar exuded from it. This had an odor resembling that of coal oil, and he supposing it to be an indication of oil, was contemplating making explorations for oil, when it was accidentally discovered to be asphaltum by a representative of the Boston syndicate.

"The commercial value," said he, "of the asphaltum in New York is $30 per ton, and it is estimated that it may be prepared from the Logan county deposits and placed in New York City at $6 per ton; so you can easily see why the land is valuable. There are considerable quantities of the asphalt covering an extended area around Bucksville, but there does not seem to be as much anywhere as on the property I sold.

"It is said that the company intends to build a $250,000 plant for refining or preparing into a commercial article the crude mineral, and that a branch road will be built from the Memphis branch or from the Owensboro and Nashville Division of the Louisville and Nashville to the place where the mineral is deposited. There is considerable rivalry among the towns along the railroad as to which will secure the branch. Three of the points mentioned in this connection are Russellville, Lewisburg and Auburn, the two former being about twelve and the latter about seven miles from the property of the Boston sydicate."

Mr. Ferguson said that the asphaltum was thought to be of fine quality, and that it only needed a little heating to be ready to spread down upon the streets.—*Nashville American.*

THE DEMAND FOR BETTER ROADS.

WITHIN the last two years, the greatest interest has been aroused in this country in roads and pavements, and the subject has been exhaustively treated. In nearly every state in the Union, the question of better roads has been discussed; and everywhere it has been recognized that the roadways in the rural districts are bad, and the cost of transportation for the farmers and others greatly increased thereby, and that the defective city pavements more or less affect public health. How to improve them, what materials are best suited for roads and pavements, and what changes are necessary in our laws has been discussed in the messages of several governors, including those of Pennsylvania and New York, before a number of legislatures, and in special road congresses called in Georgia, Texas and other states. The great interest felt in this matter is well evidenced by the success of the Road and Pavement Exposition held in Indianapolis a few weeks ago, and which far exceeded all expectation, there being present official representatives from over twenty cities.—*New Orleans Times-Democrat.*

PAVING AND MUNICIPAL ENGINEERING.

A Journal Devoted Specially to Street and Sidewalk Paving, Sewerage, Water-Works Construction, Street Lighting, and all Matters Pertaining to Municipal Engineering.

Published on the 15th of Each Month.

WILLIAM FORTUNE, Editor. - - - WILLIAM C. BOBBS, Business Manager.

OFFICE: ROOM 44, CHAMBER OF COMMERCE, - - - INDIANAPOLIS, IND.

Entered at the Post-office, Indianapolis, Ind., as second class matter.

SUBSCRIPTION: { One Year, ... $1 00. Single Copy, ... 10.

Advertisements to insure publication should reach the publication office not later than the 5th of the month.

Communications are invited, and all requests for special information on the subjects treated by this journal will receive careful attention.

Articles relating to the different branches of municipal engineering are desired. Stamps should accompany manuscripts for return postage if unavailable.

No publication devoted to special interests has ever started more auspiciously than PAVING AND MUNICIPAL ENGINEERING. *Although this is but the third number the publishers are confident that they can prove by their subscription books that it has a larger bona fide circulation than any other new publication devoted to special interests has succeeded in getting at the end of two years, and new names in all parts of the country are being added daily.*

WORDS OF ENCOURAGEMENT.

MANY letters continue to come to us commending the purposes of PAVING AND MUNICIPAL ENGINEERING and expressing appreciation of the numbers that have been issued. These words of encouragement gratifyingly re-assure us that it was correct judgment that brought the publication into existence, and it is our determination that it shall merit all support and commendation that it is receiving, and that it shall meet all reasonable expectations. The many kindly suggestions that have been made by those who evince a friendly interest in the publication are warmly appreciated, and will be given due consideration. A few of the letters received from widely separated points since the last number was issued are given below as evidence of what city engineers think as to the possible usefulness of the publication:

OMAHA, NEB., July 16.—Your paper deserves hearty support, and I have no doubt will receive it. Such a paper, circulating among city officials, publishing occasional communications from them on current subjects, can not fail to give a great amount of live information. I will take pleasure in sending you items of interest from this locality. GEO. W. TILLSON, City Engineer.

TRENTON, N. J., July 19.—I am much pleased with PAVING AND MUNICIPAL ENGINEERING, and believe it will be of great value to city surveyors and engineers. C. C. HAVEN,
Civil Engineer and City Surveyor.

AUGUSTA, GA., July 21.—PAVING AND MUNICIPAL ENGINEERING gives the very information I want. We have as yet not done any paving, except macadam, but I am hopeful that I can induce our authorities to try it in the near future.
A. H. DAVIDSON, City Engineer.

NEW ROCHELLE, N. Y., July 17.—I venture to predict for your journal a great success, IF you will only *stick to your text* and don't try to cover all departments of human industry in all parts of the world. Let us have one paper in this country devoted to municipal engineering alone. HORACE CROSBY, M. Am. Soc. C. E.

KOKOMO, IND., July 19.—PAVING AND MUNICIPAL ENGINEERING is a grand paper for municipal engineers. I hope you will be successful with it. A. W. SMITH, City Engineer.

Mr. Crosby's suggestion is in accord with the ideas and purposes of the publishers of PAVING AND MUNICIPAL ENGINEERING. The field of municipal engineering is broad enough for us. We shall endeavor to avoid the mistake of trying to make our publication an organ of one thing specially and everything else professedly and nothing properly. Municipal engineering is our text, and we shall "stick to it." There is enough in it to make it worth all the attention and space that can be given it.

PAVING IN PHILADELPHIA.

THE city of Philadelphia has for two or three years been awakening to a better appreciation of the importance of good street paving. The newspapers of the city have been agitating the question and educating the public, and to their efforts is due much of the credit for the advancement that is being made in Philadelphia in public improvements, the extent of which is indicated by the statement that in 1887 there were 45,170 linear feet of new paving in the city, in 1888 the work increased to 150,750, and last year to 192,965; yet this is but a fair beginning. Much of the work, about one-third, has been done on old streets, where cobble-stone has been replaced with improved paving. Granite blocks are most in favor, but vitrified brick, asphalt blocks, macadamizing, sheet asphalt or slag blocks are used in extent in the order named. Public sentiment seems to have decreed that the cobblestone must go. The director of Philadelphia, Mr. Louis Wagner, remarks of the repaved streets that "They are a comfort to the people using them, and an evidence of civilized government, and not the disgrace they were in their ancient cobble-stone condition."

Mr. Wagner, in his official report, gives special consideration to the question of the kind of pavement best adapted to the streets of a city like Philadelphia, "which has within its 129 square miles of territory streets used for the heaviest business traffic, thoroughfares which should be adapted to driving for pleasure in light carriages, and roads used only for farm purposes." He views the question as one of serious concern, and says some things on the subject that are worth as much consideration in many cities as in Philadelphia. The following is taken from his report:

Because of the persistent pressure, on the part of the property owners, for a street pavement that does not cost them much, and of the continued introduction of all sorts of materials which experience elsewhere, or common judgment anywhere, has condemned, or should condemn, as unfit for the making of good and durable roads, would it not be well for councils to consider, in their many ordinances directing the paving and repaving of streets, the question whether, in a few years, our streets will not be in the same deplorable condition as now, notwithstanding the large amounts of money spent for what inventors and manufacturers of paving material are pleased to call "improved" pavements.

All writers upon this subject agree that a pavement of stone blocks, such as is known in our city as "Belgian" block pavement, laid upon a proper foundation and not disturbed, except as public travel may disturb it, is the best for the purposes of a large city.

During the past few years paving with sheet asphalt has been introduced with satisfactory results in this country and abroad, and when such a pavement is laid upon a proper concrete or broken stone base, with the asphalt covering of good quality well laid, it furnishes a surface adapted to light driving, easily kept clean and which does not rapidly wear out.

The pavement next most popular in our city is of a material called "vitrified brick" which we are told, shows great wearing qualities in cities in the West. The chief of the bureau of highways reports that "the first pavement of this material was put down in this city in 1887, and already shows signs of wear that does not give much promise of its lasting qualities." This report, unfortunately for this class of pavement, is founded upon fact.

What is generally known as "asphalt" blocks, composed of a mixture of bituminous materials such as tar and pitch, and sand and gravel, pressed by heavy machinery into bricks about twice the size of the ordinary brick, was formerly largely used in paving our streets, and it continues to be used to some extent under what is called "contracts for paving private streets" by the owners of properties fronting upon said streets. The results have been uniformly so unsatisfactory that the use of this pavement should be prohibited.

Macadam or Telford pavement should be laid only in the country districts, and not where it is expected to be the permanent pavement. It is always muddy in wet weather, and dusty in dry weather, and, unless it is regularly and carefully sprinkled and rolled, it wears out more rapidly than any other kind of pavement.

"Slag" blocks, which are made of the refuse of iron furnaces, run in its fluid state into brick moulds, and with which 2,146 square yards of pavement were laid last year, have not been in use long enough to test their wearing qualities. Their condition after even the short time in which they have been used, does not give promise of durability.

The different kinds of pavement, considering all the purposes for which pavements are laid in populous business communities, in connection with their first cost and subsequent expense for maintenance, should be classified as follows:

First, "Belgian" block of good granite.
Second, Sheet asphalt.
Third, Vitrified brick.
Fourth, "Asphalt" blocks.
Fifth, Macadam or Telford not sufficiently tested. "Slag" block.

Mr. Wagner fails to give as much information regarding the experience with brick in Philadelphia as the importance of his comments makes desirable, especially in view of the fact that his reports show that for three years it has ranked second in favor with the people of his city.

MR. GEORGE W. TILLSON, the city engineer of Omaha, in his last annual report, made some observations which should be borne in mind by municipal officers everywhere who have improvement contracting under their charge. In speaking of the work done under the direction of his department, he said: "The character of the work as a whole has been good, better I think than that of the previous year, though there is still room for improvement. We have as good contractors in Omaha as will be found in any of our American cities, but they take their work for the purpose of making money, and care and watchfulness are always needed to see that the interests of the city are properly protected. Our system of letting work has now become so systematized that contractors understand before they bid the nature of the work, so that very few bills of *extras* are ever presented. I think I can truly say that during the year last past not one-fourth as many claims for extra work performed that season have been presented as in any one year since the inauguration of our present system of public improvements. This is as it should be, for the clearer a proposition for work is made, the greater the competition, and a consequent saving to the city's funds." A vast amount of trouble, and a great deal of money will be saved by cities that deal with contractors in the manner suggested by Mr. Tillson. In the language of an Indiana judge, who recently made a notable decision, "the time to determine the conditions of a contract is when it is made, and not at some subsequent time."

THE introductory article in this issue of PAVING AND MUNICIPAL ENGINEERING, by Mr. J. W. Howard, on the subject, "Real Asphaltum—How to Tell It," gives information especially valuable to municipal officers who have responsible connection with street paving, a very small number of whom, it may be safely asserted, are able to distinguish real asphaltum from the adulterated or artificial product. There is a vast amount of material that is being put down in American cities under the name of asphalt which is not genuine asphalt at all, and which will in a comparatively short time prove worthless. There is no better authority on the subject than Mr. Howard, and the information that he gives, we are hopeful, will be generally beneficial.

THE edition of the first number of PAVING AND MUNICIPAL ENGINEERING, although very large, was, soon after it had been issued, found to be inadequate. We are continually receiving requests for it from persons who desire a complete file, and these we are at present unable to comply with. It will be a favor to the publishers if all who have copies of the first number that can be spared will return them. We will gladly pay the full price for them.

MR. W. L. S. BAILEY'S article on Portland cement in this number of PAVING AND MUNICIPAL ENGINEERING gives compactly and comprehensively information that will be useful to those who are interested in cements. He has strikingly put in the fewest possible words a whole volume of knowledge.

PATCH NOTHING.

To the Editor of Paving and Municipal Engineering:

SO far, I rather like your monthly on paving and municipal engineering. It is just the thing to educate the citizens as to what constitutes good streets and roads. Millions have been spent in trying to improve streets and roads by *patching*. Let the motto be, "Patch nothing."

Water and frost are the two greatest enemies in the construction of good roads. Water, in a measure, becomes harmless, if we sink the foundation below frost and keep the road-bed dry by gutters, ditches and under-draining. It costs, of course, but if well done on the start it is done for all time.

F. R. LOCKLING, City Engineer.

Hannibal, Mo., July 20, 1890.

Paving and Grading.

Michigan City, Ind., will pave Michigan street.

Fifth street, in Saginaw, Mich., will be paved.

Iowa street, Dubuque, will be reconstructed.

Brown street is to be laid out in Brooklyne, Mass.

Work will soon commence on paving in Corsicana, Tex.

Fourth street, in Bay City, Mich., will probably be repaved.

First street, in San Jose, Cal., will be paved and improved.

The paving of Main street, Wyoming, Ala., is being agitated.

At Massillon, O., Erie street will be paved with fire brick.

Ellsworth, Me., is considering the purchase of a rock-crusher.

Santa Clara and Devine streets, in San Jose, Cal., will be paved.

Edwardsville, Illinois, will macadamize streets at a cost of $4,000.

At Youngstown, O., several streets will be widened and improved.

Whiteside street, in Chattanooga, Tenn., will be paved with asphalt.

Street improvements will probably be made soon at Wahoo, Neb.

Main street, Memphis, will probably be paved at a cost of $500,000.

Stapleton, N. Y., is considering the purchase of a steam road roller.

South Dodge street, Dubuque, Iowa, will be macadamized and curbed.

Ordinances have passed the Paducah, Ky., council for paving six streets.

In Moline, Ill., seventeen blocks will be paved with brick this season.

John R. street, in Detroit, Mich., will probably be paved with brick.

Part of Larimer street, in Denver, will be paved with bituminous rock.

An ordinance has passed council for paving sundry streets in Aurora, Ill.

Ordinances have passed the Toronto, O., council for paving several streets.

Jerry Hastings, at Newport, Ky., has the contract for improving four streets.

Twenty-eighth avenue, in Minneapolis, Minn., will be opened and extended.

North Twentieth street, in Omaha, Neb., will be paved with Colorado sandstone.

An ordinance has passed council for paving several streets in Jackson, Mich.

It is proposed to issue bonds for $2,000,000 for street paving at Memphis, Tenn.

In Evansville, Ind., Garfield, Campbell and Tenth streets will be paved with brick.

Property owners on Maple street, Columbus, O., have asked that that street be paved.

An ordinance has passed the Mattoon (Ill.) city council for the paving of Broadway.

The Bay City, Mich., board of stone road commissioners will probably soon let a contract for building three miles of stone road.

A resolution has passed council for the improvement of sundry streets in Berea, Ohio.

An ordinance has passed the Columbus, O., Council for the stone paving of Union street.

The Dayton special council committee has recommended the paving of several streets.

An ordinance has passed the Houston, Tex, council for the paving of several streets.

At Sault Ste. Marie, Mich., Keith & Co. have a contract for paving three streets, at $20,920.

Henry Voigt has been awarded the contract for paving Sixth street, in Milwaukee, Wis.

In the common council of Chelsea, Mass., an order was passed to grade Walnut street.

An ordinance has passed the Massillon (O.) council for the improvement of sundry streets.

A number of bills referring to paving the streets have passed the Camden, N. J., city council.

Captain Rawson has recommended paving a part of Nineteenth street in Washington, D. C.

An ordinance has passed the council for the paving of a number of districts in Omaha, Neb.

The contract for grading Elm street, in Bay City, Mich., has been let to George Fitzgibbons.

At Avondale, O., an ordinance has passed the council for the improvement of Ridgeway avenue.

Nathan Smith has a contract for the brick paving of Fortieth street in Des Moines, Iowa.

An ordinance has passed the Cincinnati (O.) city council for the improvement of several streets.

The Hartford (Conn.) council has been petitioned to macadamize and improve Portland street.

The contract for paving Kentucky street, San Francisco, has been let to C. B. Vincent at $200,000.

A new street, to be known as Hensley avenue, will be made in the northern part of St. Joseph, Mo.

An ordinance has passed the council for the construction of numerous brick sidewalks at Alton, Ill.

The Portsmouth, Ohio, council has rejected all bids for street paving, and will readvertise for same.

The Parker Lot Company, of Manchester, Va., has been granted the right to grade Academy lane.

Bids for paving Sherman street and St. Albin avenue, to Kehne, at Detroit, Mich., will be re-advertised.

The Rockford Construction Company has a contract for paving eight blocks of streets at Ottumwa, Iowa.

The Committee on Streets, of Chelsea, Mass., has submitted orders for the laying out of streets in Prattville.

Ordinances have at last passed the Denver (Col.) city council for the paving of Fifteenth and Sixteenth streets with asphalt.

The Dubuque, Ia., city council has ordered one block improved with jasperite at a cost of $900, as an experiment.

An ordinance has passed Evansville council for the brick curbing, stone paving and grading of part of Main street.

Brierly & Smith will probably receive the contract for improvement of Tenth street at $12,922, at Fairhaven, Wash.

At Sheffield, Ala., bonds of $10,000 have been sold, and work will at once commence on street improvements.

Ashland avenue, Denver, Col., will probably be graded and macadamized from Gallup avenue to the Boulevard.

McQuaid & Murphy have been awarded the contract for paving Sixth street, in Duluth, Minn., at a cost of $6,084.

Fourth street, the principal business thoroughfare of Olympia, Neb., will probably be widened at a cost of $75,000.

Gulbranson Bros., of West Duluth, Minn., have been awarded the contract, at $18,500, for improving Sixth street in Oneota.

A contract for paving Arch street, from Munson avenue to Hawkins street, Portland, Ind., has been let to A. Jackwa.

The petition of E. M. Patterson and others to pave Seventeenth street, in Denver, Col., has been granted by council.

A petition is being circulated at Kansas City, Mo., for the vitrified brick paving of Shawnee street, from Third to Seventh.

The bids received at Lincoln, Neb., for street paving have all been rejected, and new ones asked for for several districts.

The Nashville, Tenn., board of public works will probably grade Shelby avenue, from Fifty-ninth street, at a cost of $7,000.

Forestal Bros., of Milwaukee, have been awarded a contract for paving Bay and West Second streets, in West Superior, at $72,900.

The bid of M. E. Kane for paving West Fourth street, Marion, Ind., has been accepted. He gives bonds for the sum of $50,000.

A movement is in progress, with W. S. Parker, of the City National Bank at the head, for the introduction of paving brick in Louisville, Ky.

The first section of a brick street for Lexington, Ky., has been let to the Southern Construction Company, at $2.25 per square yard.

William Wade, proprietor of the pottery at Louisville, Neb., has put machinery in his establishment for the manufacture of paving brick.

C. G. Force, civil engineer of Cleveland, O., wants bids until August 21, for paving with common Medina stone Vega avenue and Bond street.

The commissioners' court of Dallas, Tex., has appointed a committee to purchase a road grader for each commissioner's precinct in the county.

The Detroit (Mich.) council has granted a petition for the construction of a stone pavement on Seventeenth street, between South and California.

The Artificial Stone Company, organized at Meriden, Miss., will manufacture artificial stone for pavements, curbstones, and window and door sills. It can be put down for sidewalks at a cost of $1.90 per square yard.

The street and alley intersections on Thirtieth street north from Main avenue, Omaha, will probably be paved with stone at a cast of $11,000.

A proposition is on foot to convert Sanderlin avenue, Denver, Col., extending four miles east from the City Park, into a boulevard, 120 feet wide.

An ordinance is before the Louisville council for the paving with granite and asphalt of Second street, from Broadway to College, to cost $16,000.

The contract for the improvement of Keton avenue, Columbus, O., has been let to McCloud & Geible. The McMannigal granite blocks will be used.

The district commissioners will probably pave the streets between the State, War and Navy Department building and the White House, at Washington, D. C.

The Woonsocket (R. I.) council has been petitioned for the establishment of a grade on Third avenue, and has voted to establish a grade on Coffee street.

An ordinance has passed the Columbus, O., council for paving a part of Main street with asphalt, stone blocks, Hallwood blocks, fire clay or hard-burned brick.

An ordinance has passed the Massillon, O., council for the improvement of Plum street to Main, and from Main to Charles street, by paving it with fire-brick.

At Jamestown, N. Y., the grade of Eighth street is to be raised and sundry gutters paved. Mayor Price advocates paving the gutters on the steep streets of the city.

The Bradford, Pa., council has been petitioned for the paving of Pine street with brick. A bill providing for the paving of Kane street passed in the upper house.

John H. Oreak, of Brooklyn, N. Y., has been awarded the contract for paving the last batch of streets, ordered paved by the mayor, under the local improvement law.

The contract for paving Robinwood avenue, in Toledo, from Bancroft street to Delaware avenue, with asphalt, has been let to the Warren Scharff Asphalt Company at $22,810.10.

The contract for grading Leslie avenue and Milton street, in Minneapolis, Minn., has been let to Wm. A. Dawson, at $4,740, and for grading Ryan street, to Frank P. McCann, at $3,250.

At Fort Worth, Texas, R. Vickery, Wallace Hendricks and others will establish an eighty foot wide boulevard from the eastern line of the Union Depot addition to the timber, five miles east of city.

The Board of Public Works, of Chattanooga, Tenn., will pave Market street from Fourth to the river, at a cost of $30,000; also a part of Broad street, at a cost of $14,681, and McCollie street at $35,000.

At Evanston, Ill., an ordinance has passed the council for the improvement of Benson avenue from Lincoln to Crane street, at a cost of $9,857. Also for paving and sewering Ridge avenue at a cost of $31,000.

John Grant has formed a paving company in Salt Lake, citizens of Zion subscribing largely to the stock. Frank Redman will push the enterprise whose plant in Salt Lake is said to be worth $10,000.

Alderman Sibenelaer and the city engineer of Menominee, Mich., have been instructed to visit other cities and ascertain the best plans and methods of laying cedar block pavements, with a view to the improvement of Main street.

The Southern Improvement Company, of Chattanooga, has secured a large contract for street paving with the Hallwood patent brick, at Lexington, Ky., the price paid being $2.45 per square. Other bids were $3.24, $3.00, $2.60 and $2.40.

Col. James Burgess, county recorder of deeds, of Topeka, Kan., and others, have bought a large tract of lands in the suburbs of St. Louis, and will grade streets, improve the avenues with Telford drives, and lay granitoid walks, at a cost of $30,000.

Wilson & Thatcher have the contract for paving Broadway, Duluth, Minn., from Oak to Plow, at $33,164. Forestall Bros. have been awarded a contract for paving Bay and West Second street at $72,900. Monlaugh & Co. have been awarded a contract for paving Ogden avenue, from First street to Belknap, at $34,956.

Mr. R. L. Cox, the chief clerk of the engineer department of Minneapolis, reports that J. E. Snyder has been awarded the contract for paving with cedar block Crystal Lake avenue at 80 cents a square yard. T. J. Conrey has the contract for paving Twentieth avenue N. at 83 cents, and A. G. Parkhurst is to do the curbing for 85 cents per lineal foot.

In New Haven, Conn., the park commission has petitioned for the extension of Chestnut street. Church street is to be top-dressed with asphalt. A concrete walk on Carlisle street has been recommended, as has the grading and curbing of North Bank street. Petitions have been made for concrete walks and hardening the street of Dickswell avenue and for the top-dressing of Edward street.

At Chattanooga the Warren Scharff Asphalt Paving Company has been awarded the contract for paving seven streets with Trinidad Asphalt; M. E. Maher, one street with Georgia granite; the Southern Paving Company, one street with compressed asphalt blocks, and the Southern Construction Company three streets with Hallwood blocks. Bids will be readvertised for paving Market street with granite, and two other streets with brick.

J. B. Smith & Co., of Chicago, Ill., contractors for cedar block pavement, have contracted with Clinton, Iowa, for putting down 20,000 square yards of brick pavement the present season. Fifty thousand yards of brick pavement were put down there last year by the Rockford Construction Company. Other petitions have been presented to the city council for more brick pavement. The plan adopted by City Engineer Hart is a single course of brick on a foundation of rubble and sand, the contractor to guarantee the work for five years. This, Mr. Hart thinks, gives ample time to weed out the soft brick used and remedy any other imperfections of workmanship or foundation.

Engineer S. L. Cooper, of the comptroller's office, recently made an examination of the work being done by the contractors laying new pavements in the city, and made the discovery that instead of gneiss or trap rock being used in the foundation, as called for by the specifications, limestone, a less durable material, was what many of the contractors were using. The comptroller took the matter in hand and called the attention of the commissioner of public works to the substitution. Mr. Gilroy agreed with Mr. Myers that the substitution was not warranted, and the contractors asserted that it was necessary for the reason that neither gneiss nor trap rock could be secured. This was not satisfactory, however, and the matter was only settled by the contractors agreeing to suffer a deduction of ten cents per square yard for work where the limestone was used, contrary to the specifications. The deductions thus far made are as follows: Matthew T. Baird, $200; Wm. J. Clark, $23.69; Charles Guidet, $214.98; Thomas Gearity, $150; Bernard Mahon, $27.50, and James Pollock, $142 73. —*Commercial Advertiser, New York.*

Expert judges who have examined the Utah asphalt pronounce it equal to the best in the world. Should this be the case, an industry yielding millions of dollars a year is only awaiting development. As the best and only best that will satisfy investors is the practical one of a paved street, the city council would be only encouraging a home industry by directing that at least a portion of one of the principal streets be paved with asphalt. Louis Seckles, with a number of Salt Lake gentlemen, has recently acquired the title to two valuable claims of bitumen lands, in all 320 acres. This mountain is at the head of Whitmore canon in Emery county. "Anywhere I might dig," said Mr. Seckles, "I found it, and it cut the same and smelled the same as the best specimens from other asphalt beds." The gentlemen interested in the tract are Milando Pratt, Henry Dinwoodey, Lewis Seckles, Phil Margetts, O. H. Pettitt, Phil Pugsley, Parley Pratt, Lorus Pratt, Ben W. Driggs, Jr., Edwin F. Parry, David Rideout, Valten M. Pratt, Joseph M. Eldredge and B. G. Raybould. This mine is located 150 miles southeast from the city, and within fifteen miles of the railroad.—*Salt Lake City Herald.*

Water-Works.

Water-works will be put in at Dexter, Mo.

Water-works will be put in at Hebron, Neb.

East Aurora, N. Y., will have a system of water-works.

Water-works will be built at Warren, Ill., to cost $9,000.

Centralia, Ill., is agitating the water-works question.

Water-works will probably be built at Ritzville, Wash.

Higginsville, Mo., is agitating the water-works question.

Dayton, Wash., has voted to issue bonds for water works.

Water-works may be put in at once at Kingston, Wash.

At Fort Dodge, Iowa, the water mains will be extended.

The Fond du Lac, Wis., water company will extend its main.

Fulton, Ky., will vote on issuing $25,000 bonds for water-works.

Benkelman, Neb., will probably issue bonds for water-works.

At Polo, Ill., water-works will be constructed to cost $15,000.

The citizens of Plaquemine, La., are negotiating for water-works.

A new system of water-works is being talked of at Monmouth, Ill.

The city of Ipava, Ill., has let a contract for the construction of water-works at $10,700.

The water system of Cheyenne, Wyo., will probably be extended.

The Iowa Falls, Iowa, city council will probably put in water-works.

The Palatka, Fla., water mains will be extended to Palatka Heights.

New water-works are to be built at Goffstown, N. H., at a cost of $30,000.

The Owosso, Mich., council will probably extend water mains to Corunna.

The Evansville, Ind., water-works will probably be extended to West End.

The construction of a water-works system is contemplated at Dublin, Ga.

An artesian well will probably be sunk for water-works at Greensboro, Ala.

Garnett, Kan., has voted $30,000 bonds for the construction of water-works.

Canton, Ill., will probably purchase a seven-inch deep-well steam pump.

Water-works mains will be extended to Oak Hill Cemetery at Lawrence, Kan.

Water-works are being constructed at Newcastle, Cal., under Manager Locke.

The board of public works of Aurora, Ill., will extend water mains 1,300 feet.

Cheyenne, Wash., will probably improve its water-works system at a cost of $200,000.

A contract has been let for the construction of a water-works system at Greenville, Ala.

Work will commence on the construction of water-works at Opelika, Ala., at once.

The water-works company, of Carroll, Tex., will probably sink additional artesian wells.

At Iowa Falls, Iowa, a movement is on foot to secure a complete system of water-works.

Blue Hill, Neb., will soon vote on issuing bonds for the construction of water-works.

At Tyler, Texas, a company has been formed to sink artesian wells for water-works.

Foley & Harks, have made a proposition for another system of water-works in Lincoln, Ill.

At La Crosse, Wis., the question of better water is agitated. A large reservoir may be built.

The Grand Rapids, Mich., council contemplates sinking test wells to procure pure water.

The Trinidad, Col., council has passed an ordinance to issue $100,000 bonds to build water-works.

Plans have been made for a 10,000,000 gallon reservoir for the water-works at Ft. Madison, Ia.

Michigan City, Ind., will try to secure a supply for water-works, by a system of driver wells.

Littleton, Col., contemplates the construction of water-works, artesian wells, reservoir, etc.

The Sioux City, Iowa, city council will sink a large well, to increase the water-works supply.

The Nampa Water Company of Nampa, Idaho, has been incorporated, with a capital of $100,000.

The water-works trustees of Toledo, O., will probably make important extensions of water mains.

Thirty thousand dollars will be spent in replacing the water mains of Norwalk, Ct., with larger sizes.

The Pueblo Water Gravity Company, of Pueblo, Col., has been organized, and will soon build works.

The Water-Gas Company of St. Joseph, Mo., will commence the construction of its new plant at once.

Neier, Hartford & Mitchell, are making plans for a sewer and water-works system, in Thimble, Tenn.

The Abilene, Kan., Water-works Company, will probably pipe water from Sand Springs, to the city.

The Holly Water-works system, with five and a-half miles of pipe, will be put in at Bloomington, Ind.

The Missouri River Power Company, of Helena, Montana, will have surveys made for their works at once.

Bonds for $60,000 will be issued by the city of Madison, N. J., for a pumping plant to be located at Union Hill.

The Muscatine, Iowa, Water-works Company will probably make extensive improvements in the filter, etc.

The Denver Rio Grande Company will enlarge their water-works system and supply the town of Florence, Col.

A proposition to establish a system of water-works for Shawano, Wis., has been received by Mayor Dickinson.

The Norfolk Water Company, of Norfolk, Neb., will remodel and make extensive improvements to its plant.

The Corpus Christi Water-works Company, has been incorporated at Corpus Christi, Texas, with a capital of $20,000.

An ordinance is before the house of delegates for the procuring and laying of water pipe in Forest Park, St. Louis, Mo.

The contract for extending the water mains at Great Falls, Montana, a distance of two miles, has been let to Tuck & Huelter.

The Hempstead Township Water Company of Hewlets, Long Island, N. Y., has been organized with a capital stock of $20,000.

The E. P. Allis Company has the contract for building a $75,000 pumping engine for the water-works at Milwaukee, Wis.

The Greenville, S. C., council has accepted a bid for building a water-works system; work to be commenced in sixty days.

Arnold, Neb., has passed an ordinance to vote on issuing bonds for $7,000 to sink a water well, purchase boiler, and extend water mains.

The Boulder, Col., city council, has rejected all bids for laying water pipes, on account of high bids, and the matter will be postponed.

M. C. McLilly & Co., of New York City, have obtained a franchise, and will construct water-works and a sewer system in Alexandria, La.

A contract for building pumping works and reservoir in the North End at Tacoma, Wash., has been let by Allen P. Mason to Robert P. Mullen.

The Board of Public Works, of Kansas City, Mo., will put in their water-works two additional tanks, having a capacity of ten thousand gallons.

M. McLilly & Co., of New York City, have been granted a thirty year franchise for water-works and a sanitary system at Alexandria, La., to cost $125,000.

The city of Statesville, N. C., has voted in favor of authorizing the board of aldermen to contract for water-works and they will soon be ready to receive proposals.

A new pumping station on the top of Garfield Hill, Pittsburgh, Pa., will be ready to supply water to that elevated portion of the city within six weeks or two months.

The contractors for the water-works and sewer system of Sulphur Springs, Tex., are W. W. Kellogg and John Thompson, of Denison. They will sink wells for water supply.

The Madison Construction Company has been incorporated at Edwardsville, Ill., with a capital of $25,000. The object is to build water-works, etc., in the new town of Madison.

The Provost Water-works Company of Provost, Utah, has been incorporated. The president is S. R. Thurman, the secretary D. Newton Straut. Witcher Jones is the principal stockholder.

At East Cape Girardeau, Ill., the Mississippi Valley Development Company has been incorporated, for the erection of water-works and electric lights; capital $600,000. George H. Crumb, Lawson H. Watts and Dennis W. Wilson are the directors.

The E. P. Allis Company has been awarded the contract for furnishing a pumping engine for the water-works at Milwaukee, Wis., at $76,000, and Thatcher & Breyman have the contract for laying the pipe for the new water system at $60,000.

The recently incorporated Georgia Water Company of Macon, Ga., has a capital stock of $100,000, with the privilege of increasing it to $500,000. S. R. Jaques, Wm. H. Ross, H. S. Edwards and others of the directors have asked a franchise for the construction of water-works.

The city of Meriden, Conn., is considering the matter of an increased water supply, and the common council has passed a resolution that the water committee be authorized to make and complete the purchase of a water site, recommended by said committee and approved by vote of the common council, under such conditions as may be voted at the city meeting called by the mayor; also that the superintendent of water-works be directed to cause the four-inch water mains on Sherman and Windsor avenues to be extended.

Sewers.

Sewers will be extended at Parsons, Kan.

Eagle Grove, Iowa, will put in a sewer system.

A sewer will be built on Eleventh street, at Cairo, Ill.

A sewer will be built on Pacific avenue, Santa Cruz, Cal.

A sewer will be built in Thurston street, Somerville, Mass.

A sewer will be built to cost about $13,000, at Atlanta, Ga.

At Bridgeton, N. J., a sewer will be laid in Washington street.

Omaha, Neb., will build a sewer on South Eleventh street.

Richmond, Va., will probably issue bonds for $75,000 for a sewer.

A sewer will be built on Washington street, at Albany, Oregon.

An ordinance has passed the council for several sewers in Toledo, O.

A large intersecting sewer will probably be built at Wheeling, W. Va.

Hastings, Neb., has bought a forty-acre tract of land for a sewer farm.

Glens Falls, N. Y., is agitating the construction of a sewerage system.

The Cannon Ball sewer at Ada, O., will be constructed at a cost of $9,000.

A sewer will be built in Prentiss and Jefferson streets, at Bangor, Maine.

An ordinance passed the Sandusky, O., council for a sewer in Centre street.

The rebuilding of the sewer system of Council Bluffs, Ia., is being agitated.

A contract for a better system of sewers will probably be let at St. Joseph, Mo.

Specifications have been adopted for sewers on several streets in Alameda, Cal.

The estimated cost of the Washington new complete sewer system is $3,000,000.

The Dansville, N. Y., local press is agitating the necessity of a sewerage system.

The contract for the Q. street sewer in Omaha, Neb., has been let to L. G. Stanley.

Tuskaloosa, Ala., has let a contract for sewers, to cost $6,000, to W. W. Thompson.

At La Salle, Ill., $30,000 will be expended on the construction of a sewer system at once.

An ordinance has passed the council for the construction of several sewers in Flint, Mich.

The city of Haverhill, Mass., has appropriated money for a sewer on Fountain street.

On ordinance passed the Denver, Col., council for the construction of numerous sewers.

The new sewerage system now being put in at West Superior, Wis., will cost $80,000.

The San Antonio *Times* is agitating the question of a sewer system for San Antonio, Texas.

T. S. Mell, of Rockford, has a contract for the construction of a $10,000 sewer in La Grange, Ill.

John Affeld and L. Lenke have the contract for a sewer on Western avenue, Detroit, Mich.

The city council of Superior, Wis., will probably issue $200,000 of bonds for sewer construction.

The St. Paul (Minn.) council has recommended the laying of numerous additional sewers.

Grand Forks, N. D., has voted to issue $50,000 bonds for the construction of a sewer system.

An ordinance has passed the Sandusky (O.) council for the construction of a sewer in Clinton street.

A petition is being circulated at Martin's Ferry, O., for a system of sewerage on Fourth street.

Chester E. Davis, of Chicago, will be employed to make plans for a sewer system for Winona, Minn.

City Engineer Townley, of Lincoln, Neb., has made plans for the Antelope Valley sewer, to cost $14,000.

An ordinance has passed the Leavenworth, Kan., city council for the construction of sundry sewers.

The citizens of Walnut Hill have asked for the extension of the Omaha, Neb., sewer system to that city.

Kirkland & Starkey were the lowest bidders for the sewer on Morrisette avenue, Superior, Wis., at $17,807.

A sanitary sewer will probably be constructed from Twenty-sixth street, in Denver, Col., to the city limits.

The Kansas City, Mo., board of public works will spend $50,000 in constructing sewers in three new districts.

The contract for the construction of a sewer in District 139, Kansas City, has been let to Shaw & Downing at $52,000.

The contract for the completion of the East Main street sewer, at Newark, O., has been let to W. H. Chilcoat at $24,700.

The contract for building a sewer in District No. 139, in Kansas City, has been let to Shaw & Downey, at about $50,000.

Kansas City, Mo., will advertise for bids at once for the construction of District Sewers Nos. 139 and 141, to cost $46,000.

The capacity of the sewer system now under construction at Danville, Ill., will probably be increased at a cost of $10,000.

The contract for the construction of the sewerage system at Crookston, Minn., has been let to P. O. Donnell, of Grand Forks, S. D.

The city engineer of Dallas, Texas, has been instructed to advertise for bids for sewers on Pacific avenue, to cost about $1,000.

An ordinance will probably pass the Kansas City (Mo.) council for the construction of a $10,000 sewer in the workhouse branch.

Niere, Hartford & Mitchell, engineers, of Chattanooga, Tenn., and Kansas City, Mo., have made plans for a sewer system for Florence, Ala.

The W. S. Dickey Clay Company, of Kansas City, Mo., has been awarded the contract for furnishing Salt Lake City, Utah, with sewer pipe.

The San Antonio, Tex., board has adopted a resolution directing the city attorney to draft an ordinance for the construction of a complete system of sewers near Callahan.

The Middletown, Conn., council has been petitioned for a sewer in Spring and Loveland streets, and has voted to construct a sewer through the upper part of Main street.

Brick, Douglas & Co., have been awarded the contract for the O. K. sewers in Kansas City, Mo., from Vine street to Harrison, at $59,769.65; vitrified pipe is to be used. Hard burned pipe is to be used in the section from Olive to Vine streets, the contract for which has been let to J. P. Kelly, at $29,037.57.

Bridges.

Zanesville, O., has had numerous bridges washed away.

A fine double-track bridge may be built at Waxahatchie, Tex.

At Millersburg, O., several bridges were recently washed away by storms.

A fine drawbridge will be built between Mt. Vernon and East Mt. Vernon, Wash.

An iron bridge will be built over the Gallatin, at Moore's Ranch, near Butte City, Mont.

The Houston, Cent. Ark. & N. R. R. will build a bridge across the Red River, at Alexandria, La.

The county commissioners will build an iron bridge across the Navasota River, at Mexia, Texas.

Spokane Falls, Wash., will probably build an iron bridge across the Spokane river at Monroe street.

Spring Valley, Ill., will vote, August 15, on issuing $15,000 bonds for a bridge over the Illinois river.

A seven-span, riveted plate girder bridge, the cost of which will be $160,000, is to be built at Rochester, N. Y.

The contract for the new railroad bridge at Winona, Minn., has been let to the Union Bridge Company, of New York.

The contract for building the Mosee bridge, at Seattle, Wash., has been let to the City Bridge Company, at $4,000.

The city of Omaha, Neb., will vote, August 19, on issuing bonds for $100,000 for the construction of a highway bridge.

The Continental Bridge Company has been chartered at Brownsville, Texas, to build a bridge across the Rio Grande river at that place.

Nebraska City, Neb., has voted $100,000 in bonds to the Phœnix Bridge Company to aid in building the bridge across the Missouri river.

The Capitol Hill property owners will erect a bridge across City Creek, at Ninth street, at Salt Lake City, Utah. It will probably be of iron, and will cost $35,000.

The Kenwood Bridge Company has been incorporated at Chicago, Ill., to manufacture and sell iron and steel bridges. F. W. Baker, Paul Willis and W. Murry are the directors.

The length of the Eighth street viaduct in Cincinnati will be 2,935 feet; its estimated cost is $280,000, of which amount $130,000 will be expended on the substructure.

The contracts for building the bridge over the Erie canal at Fultonville, N. Y., have been let to Isaac Thomas, for the substructure, at $3,532, and to the Rochester Bridge Works, for the superstructure, at $4,359.

The county supervisors have accepted the proposition of John J. Bartlett to build a bridge across the Platte River, near Kearney, Neb. They also appropriated $4,000 for a bridge across the same river south of Shelton.

The new double track railway bridge to be built over the Mississippi at Burlington, Iowa, by the Chicago, Burlington and Quincy Railroad Company, is to be put on the site of the old structure, which will be gradually torn away as the work goes on, without stopping the railroad traffic. Three spans are to be completed by winter.

Street Lighting.

Electric light is talked of at Maryville, Tenn.

Electric lights will be put in at Vacaville, Cal.

An electric light plant is agitated at Patterson, Ia.

Alexandria, La., is agitating the question of electric lights.

Shelbina, Mo., has voted to issue $5,000 bonds for an electric light plant.

The establishment of an electric light plant is contemplated at Dublin, Ga.

The Detroit Electric Company, of Detroit, Mich., will improve their service.

The question of putting in an electric light plant at Del Norte, Col., is being agitated.

The Turner Electric Light Company, of Centralia, has asked for a franchise in Chehalis, Wash.

Thomas F. Dunwald and other citizens of Norwalk, O., contemplate putting in an electric light plant.

Both of the electric light companies of Pueblo, Col., are making arrangements to enlarge their plants.

The Aurora Electric Light Company has a franchise to put in an electric light plant at Delavan, Ill.

The Cambridge (Ind.) city council has made arrangements for the erection of a city electric light plant.

The city of Monroe, Mich., has given the Shyler Electric Light Company a franchise to erect an electric light plant.

The council of Humboldt, Tenn., has accepted the proposition of Beck & Gardener to light that city with electricity.

The New Albany, Ind., Gas Company has made a proposition to light the business portion of the city entirely by electricity.

The North Springfield (Ill.) city council will ask for bids from both the electric light and gas companies to light the village.

The Bellingham Bay Gas Company has been incorporated with a capital of $200,000 to supply Fair Haven, Sehome and Whatcom, Wash.

The Brookline Gas Light Company, of Brookline, Mass., has been notified that if it intends to lay pipe in Tappan street within one year, it must do it now.

Bids for street lighting with electricity, recently opened in New York, N. Y., averaged thirty-five cents for each lamp per night until January 1, and afterward forty-four cents.

The Butte Electric Light and Power Company has been incorporated at Butte City, Mont., to operate an incandescent light plant. The capital invested is $250,000. W. A. Clark, Patrick A. Largey and H. F. D. Lachuel are the directors.

Street Railways.

A dummy line will be built in Greenville, S. C.

The electric street railway in Vancouver, Wash., will be extended.

A street railway will be built between Monterey, Cal., and Pacific Grove.

S. S. Dowman has been granted a franchise for his electric road in Seattle, Wash.

The street railway company of Duluth, Minn., will build a line on Twenty-fourth avenue.

A. E. Chadwick is organizing a company to establish a street railway in Port Huron, Mich.

Pensacola, Fla., has granted a franchise through the streets of the city for a belt dummy line.

The Woodruff Electric Railway Company has been incorporated, and will construct a line in Rockford, Ill.

The stockholders of the Tyler Street Railway Company, of Tyler, Texas, will probably equip with electricity.

A street railway will be built frem Portland, Ore., to Selwood and Milwaukee, to be equipped with electricity.

The Salt Lake City, Utah, council has granted the West Side Rapid Transit Company a franchise to construct lines.

At Denver, Col., the Laurence Street Electric Railroad will probably extend its line to the property of the Denver Improvement Company.

At Fernandino, Fla., J. M. Carter has been granted a franchise for the construction of a belt line of street railways. Dummies will probably be used.

A company of capitalists is being formed to build a street railway on Fourth and adjoining streets in Springfield, Ill. E. A. Wilson and Dr. A. Griffith are interested.

The new electric railway line contemplated on Montague street, Brooklyn, N. Y., is attracting considerable attention because the grades are much heavier than have as yet been used. The Coney Island and Brooklyn Railway has applied for permission to change from steam to an electric line.

Public Parks.

Port Angeles, Wash., will lay out a park.

Henderson, Minn., will lay out a new park.

A park will probably be established at Griffin, Ga.

Port Huron, Mich., will lay out a handsome park.

A new park will probably be built at Oconomowoc, Wis.

Several new parks are in contemplation at Philadelphia, Pa.

Large additions will probably be made to the East Los Angeles park.

A new lake will probably be constructed in the new park at Dallas, Tex.

The fair grounds of Dayton, Ohio, will probably be converted into a park.

A park will probably be established around the court-house, at Van Buren, Ark.

The city of Saginaw, Mich., will probably issue bonds for the construction of parks.

The Franklin park commissioners of Columbus, Ohio, will make improvements to that park.

A company has been organized to purchase land to be used for a park and fair grounds at Rolfe, Iowa.

Myers, Thorman & Kaufman of Terre Haute, Ind., will lay out a park. The city is thinking of doing the same.

The Milwaukee, Wis., Council will authorize the Park Committee to expend $40,000 in the establishment of parks.

A new park will probably be established at Cleveland, O., and extensive improvements made to the present system.

A bill has been introduced in Congress, for converting the Arlington estate at Washington, D. C., into a public park.

The South Point Park Company has been organized at Milwaukee, Wis., with a capital of $100,000. George Crook, Hiram J. Habbett and Richard Jefferson are directors.

The park improvement bonds of Patterson, N. J., are all right, and the park commissioners can now pay all outstanding claims and go ahead with embellishing the parks to the full extent of $20,000.

The commissioners of Jersey City, N. J., will build five new parks and the free-holders are to construct the county road. The parks are to cost over $1,500,000 and the road $2,000,000. The latter is the road projected to run from Bergen Point on the south along the top of the Palisades to the Bergen County line on the north.

H. C. ALEXANDER, C. E. Mem. Can. Soc. C. E. Mem. West. Soc. C. E.
FREMONT HILL, C. E. Mem. West. Soc. C. E.

ALEXANDER & HILL,

Civil Engineers

Plans and Specifications furnished for all classes o Engineering Work. Specialists on Street Paving Sewer Construction and Municipal Work generally

ROOM 6, No. 78 LA SALLE STREET,

Chicago, Ill.

YOU WILL MAKE NO MISTAKE

IF YOU CONTEMPLATE A TRIP TO

Chicago, Milwaukee, St. Paul, Minneapolis, or any Northwestern Point,

By purchasing your tickets over the

MONON * ROUTE

L. N. A. & C. R'Y.

The New Management having entirely rebuilt the line, putting in over 300,000 new ties, miles of new steel, new iron bridges, etc., etc. This, in connection with elegant Pullman Perfected Safety Vestibule Trains, composed of DAY COACHES, PARLOR and DINING CARS (the only line running Dining Cars between Indianapolis and Chicago), and Pullman Buffett Sleepers, makes this

THE LINE between Indianapolis and Chicago, also the Short Line, only 183 Miles Indianapolis to Chicago.

Be sure and purchase your tickets via the

GREAT MONON ROUTE.

Ticket Offices, 26 South Illinois Street, Massachusetts Avenue and Union Station.

JAMES BARKER, G. P. A., Chicago.
I. D. BALDWIN, D. P. A., Indianapolis.

ASPHALT MINES.

To the Editor of Paving and Municipal Engineering:

In your article, "Where Asphalt is Obtained," you omitted to mention the German mines of Limmer (Prov. Hannover), and Vorwohle (Prov. Brunswick); also the Sicilian mines, near Ragusa, which are said to be inexhaustible. The Limmer mines have been in operation since 1843, and their material got the highest medal for the best mastix at the London Exhibition of 1861.

CHAS. W. SAACKE.

New York, July 11, 1890.

A NEW SYSTEM OF STONE PAVING.

MR. DONALD NICOLL, an associate member of the Institution of Civil Engineers, is the inventor of a new system of stone street paving, which he explained as follows in a recent lecture before the Inventors' Institute:

"Blocks of granite five inches by three inches are wrapped, except on the upper surface, with waste fiber and an elastic bituminous compound, and the whole brought together in a homogeneous condition while resting on a continuous pad formed of the same substance.

"This continuous pad or slab is taken to the ground and unrolled over the usual surface of concrete; the blocks are then placed diagonally, and by a powerful lever made to join together as above mentioned, the effect being that a horseshoe finds immediate resistance for stopping or starting a vehicle. There is comparatively neither noise, mud nor dust, and, last but not least, great economy.

"The surface being non-absorbent, it is easily cleansed by an ordinary water cart. For tramway purposes no better system could be devised, seeing that the grip of the horses' feet on the granite cubes can be relied upon in all conditions of weather, and the cubes pack so close upon tram rails that ordinary traffic can not leave them exposed. Gas and water mains may be got at readily, and the same cubes or blocks relaid at small cost."

Mr. Nicoll explains that waste fibrous substances incorporated with bitumen are comparatively impenetrable, as shown by Egyptian mummy wrappings, and that this preparation (a cheap product) is not brittle, but is almost as elastic as india rubber. It does not ooze from the joints, the fiber incorporated with it acting like the calking used in forming a ship's deck. The plant substance keeping the granite blocks half an inch apart, and slightly yielding on percussion, a horseshoe has always a hold upon the granite.

RUBBLE AND SAND FOUNDATIONS.

MR. B. B. HART, the city Engineer of Clinton, Iowa, has prepared specifications for the brick paving to be done in that city, requiring that in preparing the rubble and sand foundation the sand and stone shall be thoroughly incorporated as it is placed on the street, as it is difficult and uncertain, by flushing with water, to fill all the voids in the rubble when the sand is placed on top. Mr. Hart, in a letter to PAVING AND MUNICIPAL ENGINEERING, says: "We adopted the rubble and sand foundation, with one course of brick, first, on the score of economy, and second, because it is very easy to take up and relay the pavement in case of accident to gas or water pipe under streets, which has occurred several times since pavement was laid, and has been put back in good shape by inexperienced workmen."

IMPROVEMENT EXPENDITURES IN DULUTH.

CITY ENGINEER FULLER, of Duluth, Minn., reports that during last year the municipal contract work done in that city, compared with that of the previous year, was as follows:

	1888–89.	1889–90.
Graded streets	$470,120.24	$261,043.79
Paved streets	123,210.16	130,242.06
Sanitary sewers	55,124.75	65,373.39
Storm-water sewers	99,036.55	62,115.53
Sidewa ks and crosswalks	.....	33.246.50
Total	$747,491.70	$552,011.27

THE PURINGTON PAVING BRICK COMPANY

OF GALESBURG, ILLINOIS,

Is now building one of the most extensive and best equipped plants ever established for the manufacture of Paving Brick. D. V. Purington, of Chicago, is President of the Company. Mr. Purington is one of the foremost Brick Makers in the country. With a quarter of a century experience he has a thorough knowledge of the merits of the various DRYERS. HE HAS SELECTED FOR HIS NEW WORKS

****** THE IRON-CLAD DRYER ******

This Dryer will have a Drying Capacity of SEVENTY-FIVE THOUSAND per day. Mr. Purington's selection is another evidence of the established fact that for

PAVING BRICK NO OTHER DRYER COMPARES

WITH THE IRON-CLAD DRYER

For particulars see advertisement on last page of cover and write to

THE IRON-CLAD DRYER CO., CHICAGO, ILL.

UNEQUALLED
BUCKEYE
Portland
CEMENT
OF
BELLEFONTAINE, O.

Unequaled for all purposes for which Portland Cement is used. Tests and Testimonials of Engineers and a useful pamphlet sent free on application. • •

Buckeye Portland Cement Co. Bellefontaine, Ohio.

When you write to Advertisers, mention PAVING and MUNICIPAL ENGINEERING.

F. B. DEARINGER. C. S. NIEMIER.

Dearinger & Niemier,

Floors for Warehouses, Cellars, Machine Shops, Sidewalks, Curbing, Etc. Also, Cisterns, Vats, Pipe and Brick Sewers.

Concrete Foundations,

Artificial Stone Contractors,

Portland and Keene's Cement Work.

No. 313 East Georgia St. Shop on Bates Street, between Liberty and Noble.

Indianapolis, Ind.

THE BEST AND CHEAPEST

Interstitial Filling for any kind of Block Paving,

Stone, Brick, Wood or Cobblestone, is

MURPHY'S Grout Filling

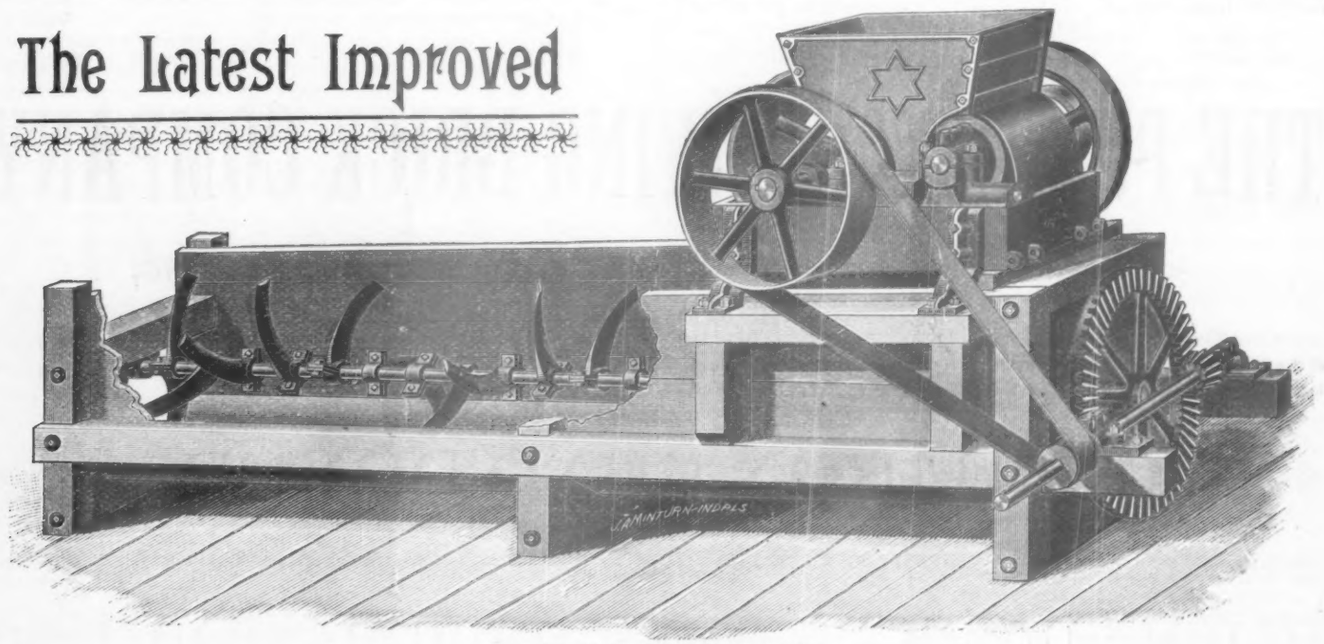
IT HAS BEEN IN USE IN COLUMBUS, OHIO, FOR SIX YEARS

Under the heaviest traffic, without any signs of wear being perceptible. It has been adopted for use hereafter in all block paving.

A secret of success in Block or Brick Paving is the use of interstitial Filling that will wear without breaking. Mr. Murphy has discovered the secret. His Grout Filling makes the most durable pavements, as experience with it demonstrates. It is not only infinitely better than coal-tar, but it is forty per cent. cheaper in cost For full information address

JOHN MURPHY, Patentee, 373 Lazelle Street, Columbus, Ohio.

The Latest Improved



COMBINED PUG MILL AND DISINTEGRATOR.

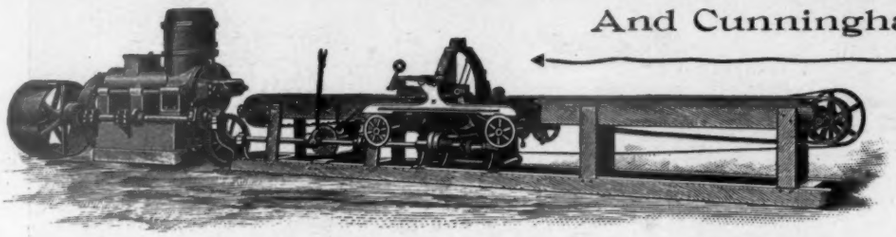
Brick & Clay Working Machinery

We are prepared to erect complete plants of any desired capacity, and keep in stock a full line of BRICK MACHINERY, PUG MILLS, DISINTEGRATORS, Mold Sanders, Clay Cars, Drums and all kinds of Brick-makers' Supplies furnished on short notice. Write for 1890 Catalogue.

C. & A. POTTS & CO., INDIANAPOLIS, IND.

The LITTLE WONDER BRICK MACHINE

And Cunningham's Automatic



Cutting Table

Send for Illustrated Catalogue.

Mention this Paper.

The Wallace Manufacturing Comp'y

FRANKFORT, INDIANA, U. S. A.

Tippett & Wood

BUILDERS OF

IRON BRIDGES

Turn Tables, Stand Pipes, Water Towers,
Steam Boilers, Digestors, Rotary Boilers,
Tanks, Stacks, Etc., Etc.
General Contractors in Iron Work.

Phillipsburg, New Jersey, U. S. A.

UNION AKRON CEMENT COMP'Y

Sole Manufacturers of the Celebrated

STAR BRAND

Akron * Cement

The strongest and most durable natural Hydraulic Cement manufactured in this country. Capacity of works, 2,000 barrels daily. Orders by lake or rail will receive prompt attention.

Office 141 Erie Street, BUFFALO, NEW YORK.

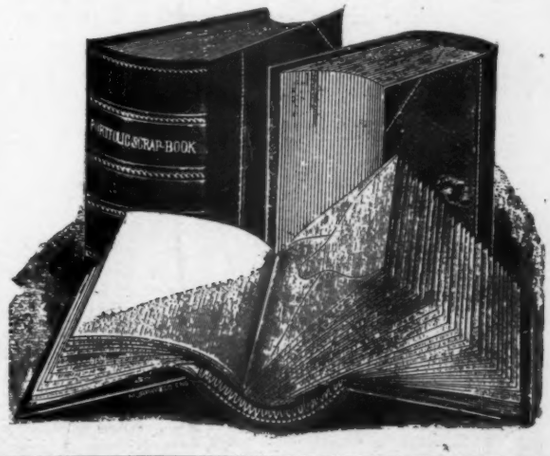
WORKS AT AKRON, NEW YORK

** BREED'S **

Patent Portfolio Scrap-Book

A Scrap-Book Without Paste.

The old-fashioned scrap-book has leaves on which scraps are pasted, as collected, without orderly arrangement. Breed's Scrap-Book has pockets, or envelopes, into which scraps are dropped and methodically filed by subjects. There is no pasting, no annoyance, no loss of time, no dirt! The subject is written on the envelope containing it and entered in the index. No matter how many scraps have accumulated, all upon the same subject are together and can be easily removed, consulted and replaced. Scraps kept in this book are not blurred by pasting, defaced by exposure or mutilated by removal. Notes for editorials, sermons, lectures and other addresses can be filed here, and a record of time and place of delivery be written on the envelope. As a receptacle for scraps, papers and writings, *methodically arranged for convenient reference*, it has no equal. It contains fifty heavy manila envelopes, with tuck, 6x9 inches in size, handsomely bound together in a book that stands upon an ordinary book-shelf. Half Amer. Russia, cloth sides. Price, post-paid, $3 net.



THE BOWEN-MERRILL CO., Indianapolis, Ind.

REMINGTON STANDARD TYPEWRITER

The Right Hand of Stenographers.

Wyckoff, Seamans & Benedict

34 East Market Street, INDIANAPOLIS, INDIANA.

THE BUSINESS MAN'S FRIEND

Unequaled for Ease of Manipulation and Quality of Work.

UNRIVALED FOR SPEED AND DURABILITY.

SHELDON BRICK CO.,

Manufacturers of Brick

Pavers a Specialty.

WRITE FOR PRICES.

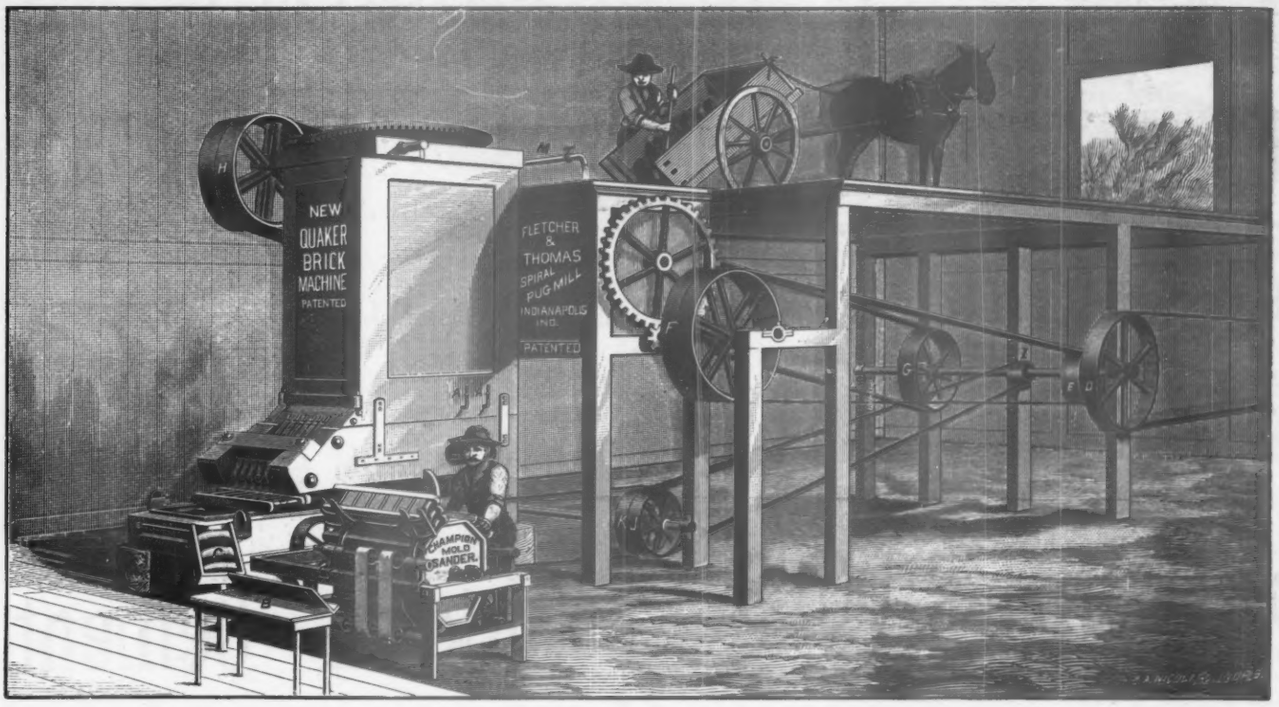
URBANA, ILL.

FOR LICENSES

To Manufacture Trinidad Asphalt Paving Blocks and Tiles and Guaranteed Supply of Asphalt, complete plans for Buildings, etc., apply to

WALTER S. WILKINSON,
President International Pavement Company.
5 CHAMBER OF COMMERCE, BALTIMORE, MD.

FLETCHER & THOMAS

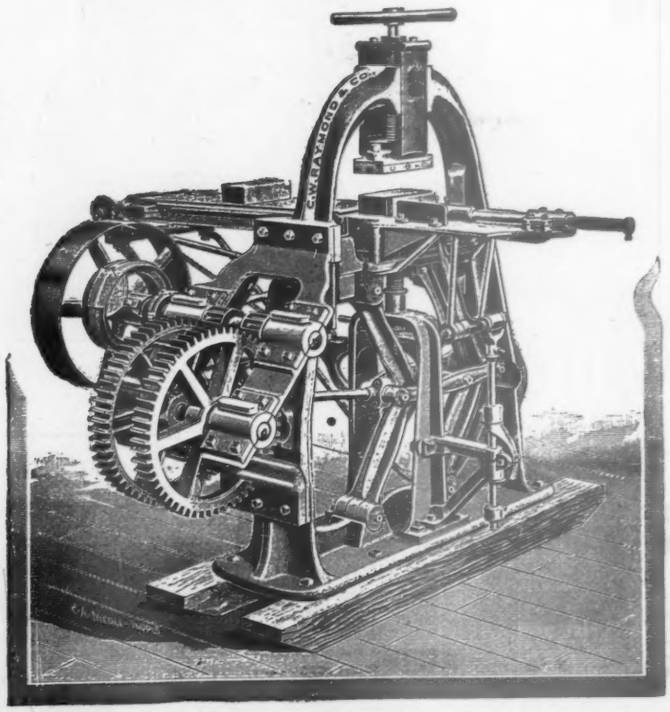


Improved Brick-Making Machinery

The above cut represents the New Quaker Complete Combined Steam Power Outfit. Capacity, 40,000 per day. Capacity of Horse-Power, 15,000 to 20,000. The most perfect machinery for making PAVING BBICKS, FIRE BRICKS or COMMON BRICKS. We make a specialty of equipping yards complete in every detail ready for work. Send for illustrated catalogue.

Correspondence Solicited. ..... **FLETCHER & THOMAS, INDIANAPOLIS, INDIANA.**

Raymond's Automatic Power Press



The Only Successful Re-press for Making

Paving * * * * * * Blocks

RED AND FIRE BRICK, ROOFING TILE, ETC.

A rapid working and powerful machine for pressing paving blocks, by which they are given great density and uniformity of size and finish. Thirty-five of these remarkable presses in daily use, making from 8 to 12 thousand finished paving blocks per day each. No first-class paving brick made without re-pressing. No plant complete without this press. Send for catalogue of paving brick machinery

C. W. RAYMOND & CO., DAYTON, OHIO.